



## Monitoring report form (Version 03.1)

### Monitoring report

<b>Title of the project activity</b>	Heqing Solar Cooker Project II
<b>Reference number of the project activity</b>	5106
<b>Version number of the monitoring report</b>	1
<b>Completion date of the monitoring report</b>	16/12/2013
<b>Registration date of the project activity</b>	16/08/2011
<b>Monitoring period number and duration of this monitoring period</b>	2 <sup>nd</sup> 01/01/2013-15/12/2013
<b>Project participant(s)</b>	<ul style="list-style-type: none"> <li>● Beijing Harmonious Energy Development Co., Ltd.</li> <li>● Swedish Energy Agency</li> <li>● Kingdom of Spain</li> <li>● Asian Development Bank, as Trustee of the Asia Pacific Carbon Fund</li> <li>● Asian Development Bank, as Trustee of the Future Carbon Fund</li> <li>● Clean Air Capital Ltd</li> </ul>
<b>Host Party(ies)</b>	China
<b>Sectoral scope(s) and applied methodology(ies)</b>	Sectoral scope: 1. Energy industries (renewable - / non-renewable sources) Selected methodology: AMS-I.C (Version 18, EB56), Thermal energy production with or without electricity
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	140,150 tCO <sub>2</sub> e
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	150,705 tCO <sub>2</sub> e

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

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The project installed 49,000 solar cookers for the poor rural residents in north-western China. The rated power of each solar cooker is 910W and the total capacity of the project is 44.59 MW thermal. The project enabled the rural residents to efficiently substitute solar energy for the fossil fuel (coal) used in daily cooking and water boiling, avoiding CO<sub>2</sub> emission generated by fossil fuel consumption.

The project implementation started since July 2011 by placing order of cookers, arrangement for distribution of cookers, and training of the monitoring team members, etc. The continued operation period for the project is 01/01/2013 - 15/12/2013 which is in the current (2<sup>nd</sup>) monitoring period. There was one monitoring period prior to the current monitoring period. The total emission reductions achieved in this monitoring period is 150,705 tCO<sub>2</sub>e.

**A.2. Location of project activity**

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The Project is located in Gaotai County and Linze County of Zhangye in Gansu province of P.R. China. The approximate locations of the centers of the townships in which the project is located are:

**Linze County**

Township	Longitude(E) Degree	Latitude(N) Degree
Shahe	100° 9'20.91"E	39° 8'52.05"N
Xinhua	100° 1'22.76"E	39°11'38.83"N
Banqiao	100°17'5.00"E	39°16'33.04"N
Pingchuan	100° 5'57.48"E	39°20'10.51"N
Liaoquan	100° 3'50.44"E	39°19'8.67"N
Yanuan	100°14'12.34"E	39°16'21.08"N
Nijiaying	100° 7'50.99"E	39° 1'49.03"N

**Gaotai County**

Township	Longitude(E) Degree	Latitude(N) Degree
Xiangdao	99°49'50.50"E	39°21'57.07"N
Heli	99°51'0.41"E	39°23'30.79"N
Nanhua	99°48'2.86"E	39°18'23.85"N
Xinba	99°52'46.83"E	39°14'37.51"N
Luotuo Cheng	99°37'29.90"E	39°21'9.83"N
Xuanhua	99°42'14.01"E	39°25'50.49"N
Heiquan	99°37'44.68"E	39°31'57.18"N
Luocheng	99°35'20.67"E	39°41'1.59"N

Each of the 49,000 solar cookers was installed in the yard of its user's home in a location where it can be fully exposed to sunshine.

**A.3. Parties and project participant(s)**

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Beijing Harmonious Energy Development Co., Ltd.	No

Sweden	Swedish Energy Agency, Asian Development Bank, as Trustee of the Asia Pacific Carbon Fund, and Asian Development Bank, as Trustee of the Future Carbon Fund	Yes
Spain	Kingdom of Spain, and Asian Development Bank, as Trustee of the Asia Pacific Carbon Fund	Yes
Netherlands	Clean Air Capital Ltd	No

#### A.4. Reference of applied methodology

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Small-scale CDM baseline methodology "AMS-I.C.(Version 18, EB56), Thermal energy production with or without electricity". For more information regarding the methodology, please refer to the link:

<http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>

#### A.5. Crediting period of project activity

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Type: fixed crediting period

Crediting period: 22/09/2011-21/09/2021

Length: 10 years

### SECTION B. Implementation of project activity

#### B.1. Description of implemented registered project activity

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As stated in section A.1, the project implementation started since July 2011 by placing order of cookers, arrangement for distribution of cookers, and training of the monitoring team members, etc. The continued operation period for the project is 01/01/2013 - 15/12/2013 which is the current (2<sup>nd</sup>) monitoring period. There was one monitoring period prior to the current monitoring period. There is no event or situations that occurred during this monitoring period, which may impact the applicability of the methodology.

#### B.2. Post registration changes

##### B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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None

##### B.2.2. Corrections

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None

##### B.2.3. Permanent changes from registered monitoring plan or applied methodology

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None

**B.2.4. Changes to project design of registered project activity**

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None

**B.2.5. Changes to start date of crediting period**

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The start date of the crediting period has been changed to 22 Sep. 2011. This change was approved by UNFCCC on 12 Dec. 2011.

**B.2.6. Types of changes specific to afforestation or reforestation project activity**

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Not applicable

**SECTION C. Description of monitoring system**

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There are 4 parameters listed in section 7.1 of the registered PDD. According to methodology AMS-I.C. (Version 18, EB56) and the registered PDD section 7.2 (sub-section 2. "Data Monitored"), parameter #1 and #2 in section 7.1 of the registered PDD (i.e., parameter A and B below) were monitored:

- (a) Number of solar cookers in operation in the proposed project (parameter A), and
- (b) The monthly operating time of each solar cooker (parameter B).

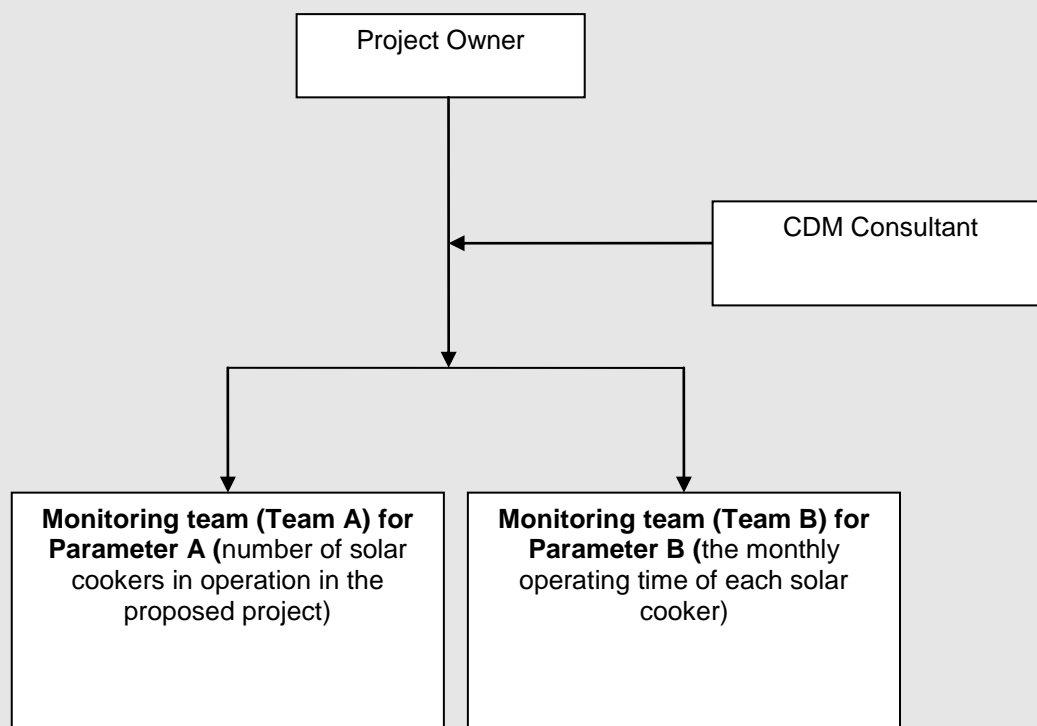
Parameter #3 and #4 in section 7.1 of the registered PDD are the data from reference documents which only need to be updated if there is an update on the latest available data. These two parameters are:

"Monthly solar irradiance rate in project region" ( $R_i$ ) and

"Baseline emission factor of coal" ( $EF_{FF,CO2}$ ).

For  $R_i$ , the latest available data released in November 2013 were used in the monitoring report. For  $EF_{FF,CO2}$ , the latest available data is still the IPCC default value used in registered PDD. For more details of these two parameters, please refer to parameter #3 and #4 in section D.2 of this monitoring report.

Since the monitoring of  $R_i$  and  $EF_{FF,CO2}$  only involves obtaining the latest available data from reference documents, which is handled by project owner, the monitoring system only need to address the monitoring of parameter A and B. Below is the organization structure of the monitoring system for parameter A and B:



#### Roles and Responsibilities:

The monitoring process was conducted through the coordination between the project owner and local Rural Energy Stations<sup>1</sup> (RES), the governmental organization in charge of the rural energy affairs.

In general, the project owner was responsible for overall management of the entire monitoring process as well as data analyzing, checking, and archiving; RES was responsible for the raw data collection and recording, and all the raw data were confirmed by RES. The project owner worked closely with RES to ensure proper equipment installation, training of the users, monitoring, document preservation, and maintenance.

Specifically, under the project owner, there were monitoring teams for the monitoring of parameter A (number of solar cookers in operation in the proposed project) and parameter B (the monthly operating time of each solar cooker). The monitoring teams consist of personnel from RES and project owner. For the details of the monitoring team, please refer to the table below.

Due to the non-industrial nature of the project, emergency procedures are not applicable to the project. For QA/QC procedures, please refer to QA/QC procedures in section D.2.

Monitoring Plan in PDD	Monitoring Process Implemented
<b><u>For number of solar cookers in operation in the proposed project (Parameter A):</u></b>  <b>B.7.1 of PDD:</b> The initial value of this parameter will be determined by the sales contract of the solar cookers and then this parameter will be monitored, recorded, and archived at each monitoring period.	<b><u>For number of solar cookers in operation in the proposed project (Parameter A):</u></b>  The sales contracts have been presented to the verification team during the first verification. 49,000 solar cookers were ordered and installed initially.  The logo of the project and the user name was put on

<sup>1</sup> Refer to Linze Rural Energy Station and Gaotai Energy and Zoning Office (The former name of the latter is Gaotai Rural Energy Station) .

<p><b>B.7.2 of PDD:</b></p> <ul style="list-style-type: none"> <li>● Sampling survey method will be used for the monitoring of parameter A. 79 sample users will be randomly selected from the 49,000 users within the project boundary. Before the beginning of each monitoring period, a set of 79 samples will be drawn for the monitoring of parameter A. Before the beginning of the next monitoring period, a new round of random sampling will be conducted among the 49,000 users to generate a new set of 79 samples which will be monitored during the forthcoming monitoring period.<sup>2</sup></li> <li>● A monitoring team (Team A) will be set up to conduct the monitoring of the number of operating cookers of the sample users. The monitoring personnel will be trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle.</li> <li>● The monitoring will be conducted during the last 3 months of each monitoring period. A table will be used for monitoring and recording this parameter.</li> <li>● To track the solar cookers, the logo of the project will be put on each of the solar cookers involved in the project. Moreover, the name of the user will be put on the cooker that the user is going to receive.</li> <li>● For the transfer of solar cookers, the monitoring team will ensure that the transferee is also located within the project boundary of the proposed project, and will record the transferor, transferee, and the time of transfer.</li> </ul>	<p>each of the cookers during the distribution process.</p> <p>Sampling survey method was used in the monitoring of parameter A and 79 samples were randomly selected from 49,000 solar cook users using MS Excel software in December 2012.</p> <p>The monitoring of this parameter was conducted by monitoring team A. 2 groups in Team A were responsible for on-site monitoring and each group consisted of 2 people (one from local Rural Energy Station ( "RES") and the other from project owner). All the team members were properly trained beforehand so that they were fully aware of the monitoring procedures and the conservative principle. The monitoring of this parameter involved visiting each of the abovementioned sample users by team A. From November 25, 2013 to December 1, 2013, team A checked if the cooker is in operation, and if the logo of the project and the user name is on the cooker through visual observation and short conversation.</p> <p>After the visit to households, the monitoring results were recorded in the monitoring table substantially in the form shown in PDD section B.7.2.Clause 3. Then all the operational cookers were summed up to generate the total number of cookers in operation. There was no transfer of cookers during this monitoring period. All the monitoring data were collected, recorded and confirmed by the monitoring team and the personnel of RES, and then provided the records to the project owner.</p>
<p><b><u>For the monthly operating time of each solar cooker (Parameter B):</u></b></p> <p><b>B.7.2 of PDD:</b></p> <ul style="list-style-type: none"> <li>● Sampling survey method will be used for the monitoring of parameter B. 79 sample users will be randomly selected</li> </ul>	<p><b><u>For the monthly operating time of each solar cooker (Parameter B):</u></b></p> <ul style="list-style-type: none"> <li>● Sampling survey method was used for the monitoring of parameter B and 79 samples were randomly selected from 49,000 solar cooker</li> </ul>

<sup>2</sup> The original text in the registered PDD is: “Before the beginning of each monitoring period, two sets of 79 samples will be drawn, one set for the monitoring of parameter A and the other set is for the monitoring of parameter B. Before the beginning of the next monitoring period, a new round of random sampling will be conducted among the 49,000 users to generate two new sets of 79 samples which will be monitored during the forthcoming monitoring period.”

In the above text of PDD, the sampling for parameters A and B are described together as two sets of 79 samples (one set for parameter A and the other set for parameter B). For more clarity, the description in this monitoring report splits the original description in PDD and describes the sampling for each parameter separately. The description in this monitoring report has the exactly same meaning as the original text in PDD.

<p>from the 49,000 users within the project boundary. Before the beginning of each monitoring period, a set of 79 samples will be drawn for the monitoring of parameter B. Before the beginning of the next monitoring period, a new round of random sampling will be conducted among the 49,000 users to generate a new set of 79 samples which will be monitored during the forthcoming monitoring period.<sup>3</sup></p> <ul style="list-style-type: none"> <li>• A monitoring team (Team B) will be set up to conduct the daily monitoring of the operating hours of the sample users.</li> <li>• The monitoring forms will be filled out daily by Team B members to record the daily usage data of these sample users. At least once a month Team B leader will collect monitoring forms from Team B members and the quality of data will be checked.</li> </ul>	<p>users using MS Excel Software in December 2012.</p> <ul style="list-style-type: none"> <li>• To monitor this parameter, monitoring Team B was set up. Team B consisted of 2 persons from RES and they recorded the operating hours of the sample users in monitoring forms. The monitoring personnel used phone call, SMS message, or visited the user face-to-face to get the data.</li> </ul> <p>At the end of each month during the monitoring period, the monitoring forms were collected and the paper documents were converted into electronic form and archived. The quality of data was checked by the “RES” and project owner separately.</p>
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## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

<b>Data / Parameter:</b>	1. $R$
Unit:	W/m <sup>2</sup>
Description:	Standard solar irradiance rate used to calculate rated power of solar cooker
Source of data:	National Standard of the People's Republic of China, GB No.: NY/T219-2003
Value(s) applied:	700
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	2. $\eta$
Unit:	N/A
Description:	Solar cooker's thermal efficiency
Source of data:	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Value(s) applied:	65%
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	3. $\eta_{BL,thermal}$
Unit:	N/A
Description:	Thermal efficiency for the traditional coal furnace

<sup>3</sup> Same as footnote 2

Source of data:	The highest value of measured data.
Value(s) applied:	14.6%
Purpose of data:	Calculation of baseline emissions
Additional comment:	

**D.2. Data and parameters monitored**

<b>Data / Parameter:</b>	1. <i>n</i>																																		
Unit:	Not applicable																																		
Description:	Number of solar cookers in operation in the proposed project																																		
Measured/ Calculated / Default:	Measured and calculated.																																		
Source of data:	Sales contract and invoice of the solar cookers and monitoring records of monitoring team																																		
Value(s) of monitored parameter:	<p>The following table shows the number of cookers in operation out of the 79 samples:</p> <table border="1"> <thead> <tr> <th>Township</th><th>Number</th></tr> </thead> <tbody> <tr><td>Shahe</td><td>6</td></tr> <tr><td>Xinhua</td><td>8</td></tr> <tr><td>Banqiao</td><td>7</td></tr> <tr><td>Pingchuan</td><td>4</td></tr> <tr><td>Liaoquan</td><td>7</td></tr> <tr><td>Yanuan</td><td>7</td></tr> <tr><td>Nijiaying</td><td>6</td></tr> <tr><td>Xiangdao</td><td>9</td></tr> <tr><td>Heli</td><td>6</td></tr> <tr><td>Nanhua</td><td>7</td></tr> <tr><td>Luotuocheng</td><td>4</td></tr> <tr><td>Xuanhua</td><td>6</td></tr> <tr><td>Heiquan</td><td>2</td></tr> <tr> <td>Total number of cookers in operation out of the 79 sample users</td><td><b>79</b></td></tr> <tr> <td>Percentage of cookers in operation out of 79 sample users</td><td><b>100%</b></td></tr> <tr> <td>Total number of operational cookers based on sample user result</td><td><b>49000</b></td></tr> </tbody> </table>	Township	Number	Shahe	6	Xinhua	8	Banqiao	7	Pingchuan	4	Liaoquan	7	Yanuan	7	Nijiaying	6	Xiangdao	9	Heli	6	Nanhua	7	Luotuocheng	4	Xuanhua	6	Heiquan	2	Total number of cookers in operation out of the 79 sample users	<b>79</b>	Percentage of cookers in operation out of 79 sample users	<b>100%</b>	Total number of operational cookers based on sample user result	<b>49000</b>
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Percentage of cookers in operation out of 79 sample users	<b>100%</b>																																		
Total number of operational cookers based on sample user result	<b>49000</b>																																		
Monitoring equipment:	Monitoring equipment is not necessary, and thus not used.																																		
Measuring/ Reading/ Recording frequency:	At least once a year																																		
Calculation method (if applicable):	The percentage of number of solar cookers in operation out of the 79 samples was calculated, and then the number of solar cookers in operation in the proposed project was calculated by using the abovementioned percentage multiplying 49000, the total number																																		



	of cookers.																								
QA/QC procedures:	<ul style="list-style-type: none"> <li>Before implementing the project, the personnel of monitoring teams were trained on how to properly conduct the monitoring process.</li> <li>The solar cookers used for the project were tested before the operation of the project by authorities to ensure their specs and quality meets the requirements of the project.</li> <li>There are maintenance and repair plan ready for the solar cookers. This plan will ensure the cookers in the project can remain in operational condition.</li> <li>For missing or damaged data record, zero value is used for the missing or damaged data, which is the most conservative approach.</li> </ul>																								
Purpose of data:	Calculation of baseline emissions																								
Additional comment:	Records were kept in electronic form and paper form.																								
<b>Data / Parameter:</b>	2. $t_i$																								
Unit:	Hour																								
Description:	The monthly operating time of each solar cooker																								
Measured/ Calculated / Default:	Measured and calculated.																								
Source of data:	Usage time measured by the project monitoring team																								
Value(s) of monitored parameter:	<table border="1"> <tbody> <tr><td>Jan-2013</td><td>150.78</td></tr> <tr><td>Feb-2013</td><td>122.71</td></tr> <tr><td>Mar-2013</td><td>149.88</td></tr> <tr><td>Apr-2013</td><td>139.73</td></tr> <tr><td>May-2013</td><td>133.83</td></tr> <tr><td>Jun-2013</td><td>136.20</td></tr> <tr><td>Jul-2013</td><td>121.27</td></tr> <tr><td>Aug-2013</td><td>139.26</td></tr> <tr><td>Sep-2013</td><td>138.85</td></tr> <tr><td>Oct-2013</td><td>157.18</td></tr> <tr><td>Nov-2013</td><td>140.15</td></tr> <tr><td>Dec-2013</td><td>78.20</td></tr> </tbody> </table>	Jan-2013	150.78	Feb-2013	122.71	Mar-2013	149.88	Apr-2013	139.73	May-2013	133.83	Jun-2013	136.20	Jul-2013	121.27	Aug-2013	139.26	Sep-2013	138.85	Oct-2013	157.18	Nov-2013	140.15	Dec-2013	78.20
Jan-2013	150.78																								
Feb-2013	122.71																								
Mar-2013	149.88																								
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Jun-2013	136.20																								
Jul-2013	121.27																								
Aug-2013	139.26																								
Sep-2013	138.85																								
Oct-2013	157.18																								
Nov-2013	140.15																								
Dec-2013	78.20																								
Monitoring equipment:	Clock or watch No calibration requirement is specified in the registered PDD and the applied Methodology AMS-I.C version 18.																								
Measuring/ Reading/ Recording frequency:	<ul style="list-style-type: none"> <li>The usage time of cookers were measured and recorded daily</li> <li>At the end of each month, all the daily data of the past month were summarized to produce the monthly usage time.</li> </ul>																								
Calculation method (if applicable):	(1) For each of the 79 sample users, measure and record their daily usage time, then sum up all the daily usage time in a month to get the monthly usage time of each user; (2) Sum up the monthly usage time of all the 79 users to get the total monthly usage time of the 79 users.																								

	(3) Divide the number obtained in (2) by 79 to get the average monthly operating time of each solar cooker.
QA/QC procedures:	<p>Before implementing the project, the personnel of monitoring teams will be trained on how to properly conduct the monitoring process.</p> <p>The following process was conducted for missing or damaged data record:</p> <ol style="list-style-type: none"> <li>1. The general principle is that zero value is used for the missing or damaged data. This is most conservative approach. The monitoring personnel were trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle. During the monitoring process, the monitoring personnel were required to strictly abide by the above conservative principle in data recording, i.e., use zero values for all the missing or damaged data.</li> <li>2. If this is due to the working error of the monitoring personnel, further train the person until he or she can perform the job properly. And in the mean time, use zero value for the missing or damaged data;</li> <li>3. If this is due to the inability or attitude of a particular worker in monitoring team, dismiss such worker and re-hire those with proper ability and attitude. And in the mean time, use zero value for the missing or damaged data;</li> <li>4. If the monitoring team as a whole does not meet the job requirement of monitoring process, a new monitoring team that meets the requirement was created;</li> <li>5. If the data reported by the user significantly higher than the normal range by common sense, the monitoring personnel asked for the reason. If the reason belongs to one of the following: 1) holidays celebration, 2) wedding or funeral, or 3) family/friends party, the reason is considered to be valid. Then the reason is recorded along with the data. Otherwise, zero value is used for that day's data.</li> </ol>
Purpose of data:	Calculation of baseline emissions
Additional comment:	Records were kept in electronic form and paper form.
<b>Data / Parameter:</b>	3.R <sub>i</sub>
Unit:	W/m <sup>2</sup>
Description:	Monthly solar irradiance rate in project region

Measured/ Calculated / Default:	Measured																										
Source of data:	Gansu Meteorological Service Centre (latest available data <sup>4</sup> released on 25 Nov. 2013, which is suitable to be applied to the entire monitoring period)																										
Value(s) of monitored parameter:	<table> <tr> <th>Month</th><th>Value</th></tr> <tr><td>1</td><td>408.7</td></tr> <tr><td>2</td><td>503.4</td></tr> <tr><td>3</td><td>635.1</td></tr> <tr><td>4</td><td>738.5</td></tr> <tr><td>5</td><td>799.7</td></tr> <tr><td>6</td><td>814.4</td></tr> <tr><td>7</td><td>829.2</td></tr> <tr><td>8</td><td>767.8</td></tr> <tr><td>9</td><td>696.3</td></tr> <tr><td>10</td><td>537.1</td></tr> <tr><td>11</td><td>410.8</td></tr> <tr><td>12</td><td>363.0</td></tr> </table>	Month	Value	1	408.7	2	503.4	3	635.1	4	738.5	5	799.7	6	814.4	7	829.2	8	767.8	9	696.3	10	537.1	11	410.8	12	363.0
Month	Value																										
1	408.7																										
2	503.4																										
3	635.1																										
4	738.5																										
5	799.7																										
6	814.4																										
7	829.2																										
8	767.8																										
9	696.3																										
10	537.1																										
11	410.8																										
12	363.0																										
Monitoring equipment:	Not applicable																										
Measuring/ Reading/ Recording frequency:	At least once a year with the latest available complete set of data obtained from relevant authoritative resources.																										
Calculation method (if applicable):	Not applicable																										
QA/QC procedures:	The data is from an official source (. No additional QA/QC procedure is necessary.																										
Purpose of data:	Calculation of baseline emissions																										
Additional comment:																											

<b>Data / Parameter:</b>	4.EF <sub>FF,CO2</sub>
Unit:	tCO <sub>2</sub> /TJ
Description:	Baseline emission factor of Coal
Measured/ Calculated / Default:	Default
Source of data:	IPCC2006, page 2.22, Table2.5
Value(s) of monitored parameter:	94.6
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Not applicable

<sup>4</sup> 1996-2011 solar irradiance data

Calculation method (if applicable):	Not applicable
QA/QC procedures:	The data is from an official source. No additional QA/QC procedure is necessary.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

### D.3. Implementation of sampling plan

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According to the registered PDD, simple random sampling (with sample size of 79) was used for number of solar cookers in operation in the proposed project (Parameter A) and the monthly operational time of each solar cooker (Parameter B). For each parameter, 79 sample users were randomly selected from users within the project boundary.

#### Checking reliability

#### Parameter A (Number of solar cookers in operation in the proposed project)

The monitoring result of this parameter is that all the cookers are operational for sample users. This means that the proportion of operational cooker is 1, i.e.,  $p = 1$ . According to "Best Practices Examples Focusing on Sample Size and Reliability Calculations" (EB67, Annex 6), paragraph 189, when  $p$  is very large (as in this case), a 90% confidence interval should be calculated as follows:

$$\frac{A - B}{C} \text{ to } \frac{A + B}{C}$$

Where:

$$A = 2np^{\wedge} + 1.645^2$$

$$B = 1.645 \sqrt{1.645^2 + 4np^{\wedge}(1 - p^{\wedge})}$$

$$C = 2(n + 1.645^2)$$

$n$  is the sample size

$p^{\wedge}$  is the sample proportion calculated

In our case,  $n = 79$ ,  $p^{\wedge} = 1$

Putting the information together gives:

$$\frac{A - B}{C} = 0.9669 \quad \frac{A + B}{C} = 1$$

Therefore, for the proportion of solar cookers in operation, the confidence interval is 0.9669 to 1, i.e.,  $p = 0.98345 \pm 0.01655$  (Note:  $0.98345 = (1 + 0.9669)/2$ , and  $0.01655 = (1 - 0.9669)/2$ )

Relative precision is  $0.01655/0.98345 = 1.68\%$

Therefore, the relative precision of the data is 1.68%, meeting the required precision of 10%.

#### Parameter B (The monthly operating time of each solar cooker)

According to "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities" (EB75, Annex 8) appendix 4, paragraph 11-17, confidence/precision should be checked following the steps below:

$$(i) \quad \text{Standard error of the mean} = \sqrt{(1 - f) \frac{s^2}{n}}$$

$f$  is the sampling fraction – the proportion of the population that is sampled.

$s^2$  is the sample variance ( $s$  is the sample standard deviation) of the monthly usage hours per user

$n$  is the sample size.

In our case,  $n = 79$ , and the population = 49000.

Using Excel, we can calculate

$$s = 21.7778$$

Mean value of monthly usage hours per user = 134.0028

Putting all these pieces of information together gives:

$$\text{Standard error of the mean} = \sqrt{\left(1 - \frac{79}{49000}\right) \times \frac{s^2}{79}} = 2.4482$$

(ii) t-value

This value depends on the level of confidence and the size of the sample. The exact figure can be acquired from statistical tables for the t-distribution, or using standard statistical software. The value can also be derived in Microsoft Excel using the TINV function.

For a sample size of 79 and 90% confidence, using the TINV function in Microsoft Excel, the t-value is 1.6646.

(iii) Precision

The precision associated with an estimate is: t-value × standard error of the mean.

The precision of the monthly usage (in hours) per user, assuming 90% confidence, is therefore:

$$\pm (1.6646 \times 2.4482) = \pm 4.0754.$$

The ratio of this relative to the mean monthly usage per user is:

$$4.0754/134.0028 = 3.04\%.$$

Therefore, the relative precision of the data over the monitoring period is 3.04%, meeting the required precision of 10%.

The relative precision of data was also calculated on monthly basis using the above method. All the precision values calculated on monthly basis are smaller than the 10% precision value required, which gives additional assurance that the precision is within the required range. For details of these calculations, please refer to the attached Excel calculation sheet.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

According to the registered PDD, the emission reduction can be calculated in the following table using the parameters below:

$$BE_y = n \sum [910.0 \cdot (R_i / 700) \cdot t_i \cdot 3.6 \times 10^{-9}] \cdot EF_{CO_2} / \eta_{BL,thermal} \quad (i = 1, 2, \dots, 12)$$

Where:

$R_i$   $R_i$  is the actual solar irradiance rate in month  $i$  in  $W/m^2$ . The values adopted are parameter #3 in the data table D.2

$t_i$   $t_i$  is the usage time of the solar cooker in month  $i$  in hours. The values adopted are parameter #2 in table D.2

$n$  The total number of solar cookers installed by the proposed project. The values adopted is 49,000 (refer to parameter #1 in table D.2 for details).

$EF_{CO_2}$  The  $CO_2$  emission factor of coal ( $tCO_2e/TJ$ ). IPCC default emission factor of  $94.6tCO_2e/TJ$  was adopted in the proposed project (refer to parameter #4 in table D.2).

$\eta_{BL,thermal}$  The efficiency of the coal-fired stove that would have been used in the absence of project

activity. The value adopted is 14.6% (refer to parameter #3 in table D.1)

The result is summarized in the tables below:

Month	Time Interval	Solar irradiance rate	Actual Power of Solar Cooker	Monthly Usage Time	Net Heat Supplied Monthly	CER Generated Monthly
		$R_i$	$P_i$ $= 910 \cdot (R_i/700)$ Equation (8) in PDD	$t_i$	$HG_i$ $= n \cdot [P_i \cdot t_i \cdot (3.6 \times 10^{-9})]$ Equation (6) in PDD	$BE_i$ $= HG_i \cdot EF \cdot CO_2$ $/\eta_{BL, thermal}$ Equation (5) in PDD
		(W/m <sup>2</sup> )	(W)	(hour)	(TJ)	(tCO <sub>2</sub> e)
2013-01	01/01/2013 – 31/01/2013	408.7	531.3	150.78	14.13158	9156
2013-02	01/02/2013 – 28/02/2013	503.4	654.4	122.71	14.16540	9178
2013-03	01/03/2013 – 31/03/2013	635.1	825.6	149.88	21.82881	14144
2013-04	01/04/2013 – 30/04/2013	738.5	960.1	139.73	23.66448	15333
2013-05	01/05/2013 – 31/05/2013	799.7	1039.6	133.83	24.54290	15902
2013-06	01/06/2013 – 30/06/2013	814.4	1058.7	136.20	25.43580	16481
2013-07	01/07/2013 – 31/07/2013	829.2	1078.0	121.27	23.05928	14941
2013-08	01/08/2013 – 31/08/2013	767.8	998.1	139.26	24.51998	15888
2013-09	01/09/2013 – 30/09/2013	696.3	905.2	138.85	22.17054	14365
2013-10	01/10/2013 – 31/10/2013	537.1	698.2	157.18	19.35922	12544
2013-11	01/11/2013 – 30/11/2013	410.8	534.0	140.15	13.20268	8555
2013-12	01/12/2013 – 15/12/2013	363.0	471.9	78.02	6.50954	4218

Using Equation (4) in PDD, total Baseline Emissions in the monitoring period is **150,705 tCO<sub>2</sub>e**

Therefore, the total Baseline Emissions generated in the monitoring period is **150,705 tCO<sub>2</sub>e**.

## E.2. Calculation of project emissions or actual net GHG removals by sinks

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According to the registered PDD and the applied methodology, there is no project emission.

### E.3. Calculation of leakage

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According to the registered PDD and the applied methodology, there is no project leakage.

### E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e)
<b>Total</b>	150,705	0	0	150,705

### E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	140,150	150,705

#### CERs estimated in ex-ante calculation of registered PDD

Month	Time Interval	Monthly CERs in registered PDD (tCO <sub>2</sub> e)
2013-01	01/01/2013 – 31/01/2013	7848
2013-02	01/02/2013 – 28/02/2013	9641
2013-03	01/03/2013 – 31/03/2013	12206
2013-04	01/04/2013 – 30/04/2013	14159
2013-05	01/05/2013 – 31/05/2013	15274
2013-06	01/06/2013 – 30/06/2013	15527
2013-07	01/07/2013 – 31/07/2013	15796
2013-08	01/08/2013 – 31/08/2013	14688
2013-09	01/09/2013 – 30/09/2013	13381
2013-10	01/10/2013 – 31/10/2013	10346
2013-11	01/11/2013 – 30/11/2013	7898
2013-12	01/12/2013 – 15/12/2013	3386 <sup>5</sup>
<b>Total</b>		<b>140,150</b>

<sup>5</sup> The ex-ante calculation for December in registered PDD is 6997 tCO<sub>2</sub>e, Dec 1~15 is 15 days. Thus, the ex-ante calculation for Dec 1~15 is 6997\*(15/31) = 3386

**E.6. Remarks on difference from estimated value in registered PDD**

&gt;&gt;

The actual monitored emission reduction (ER) is 150,705 tCO<sub>2</sub>e, which is higher than the estimated 140,150 tCO<sub>2</sub>e in PDD. The higher actual ER is because the usage time of the cookers is generally higher than the estimated value in PDD in this monitoring period, which leads to the higher actual ER value. The difference between the actual ER value and estimated value is reasonable.

**E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards**

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	0	150,705

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**Document information**

Version	Date	Description
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
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