



Monitoring report form
(Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT

Title of the project activity	Heqing Solar Cooker Project II	
UNFCCC reference number of the project activity	5106	
Version number of the monitoring report	1.0	
Completion date of the monitoring report	26/12/2016	
Monitoring period number and duration of this monitoring period	6 th 01/11/2015-30/11/2016	
Project participant(s)	<ul style="list-style-type: none"> ● Beijing Harmonious Energy Development Co., Ltd. ● Swedish Energy Agency ● Kingdom of Spain (withdrawn) ● Asian Development Bank as Trustee of the Asia Pacific Carbon Fund (withdrawn) ● Asian Development Bank as Trustee of the Future Carbon Fund ● Clean Air Capital Ltd 	
Host Party	China	
Sectoral scope(s)	Energy industries (renewable - / non-renewable sources)	
Selected methodology(ies)	AMS-I.C (Version 18, EB56), Thermal energy production with or without electricity	
Selected standardized baseline(s)	N/A	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	153,545 tCO ₂ e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0	153,545 tCO ₂ 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 CO₂ 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 01/11/2015 – 30/11/2016 which is the current (6th) monitoring period. There were 5 monitoring periods prior to the current monitoring period. The total emission reductions achieved in this monitoring period is 153,545 tCO₂e.

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
Nijiaiyang	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
Luotuocheng	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

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 whether 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

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Sweden	Swedish Energy Agency, Asian Development Bank as Trustee of the Asia Pacific Carbon Fund (withdrawn), and Asian Development Bank as Trustee of the Future Carbon Fund	Yes
Spain	Kingdom of Spain (withdrawn), and Asian Development Bank as Trustee of the Asia Pacific Carbon Fund (withdrawn)	Yes
Netherlands	Clean Air Capital Ltd	No

A.4. Reference of applied methodology and standardized baseline

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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

A.6. Contact information of responsible persons/entities

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Beijing Harmonious Energy Development Co., Ltd.

Room 609, Building 9, Lippo Plaza

No. 8 Ronghua Middle Road

Beijing, China

Please refer to Appendix 1 for more contact details.

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 01/11/2015 – 30/11/2016 which is the current (5th) monitoring period. There were 4 monitoring periods prior to the current monitoring period. The total emission reductions achieved in this monitoring period is 153,545 tCO₂e. 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, applied methodology or applied standardized baseline**

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None

B.2.2. Corrections

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None

B.2.3. 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.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

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None

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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None

B.2.6. Changes to project design of registered project activity

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None

B.2.7. 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).

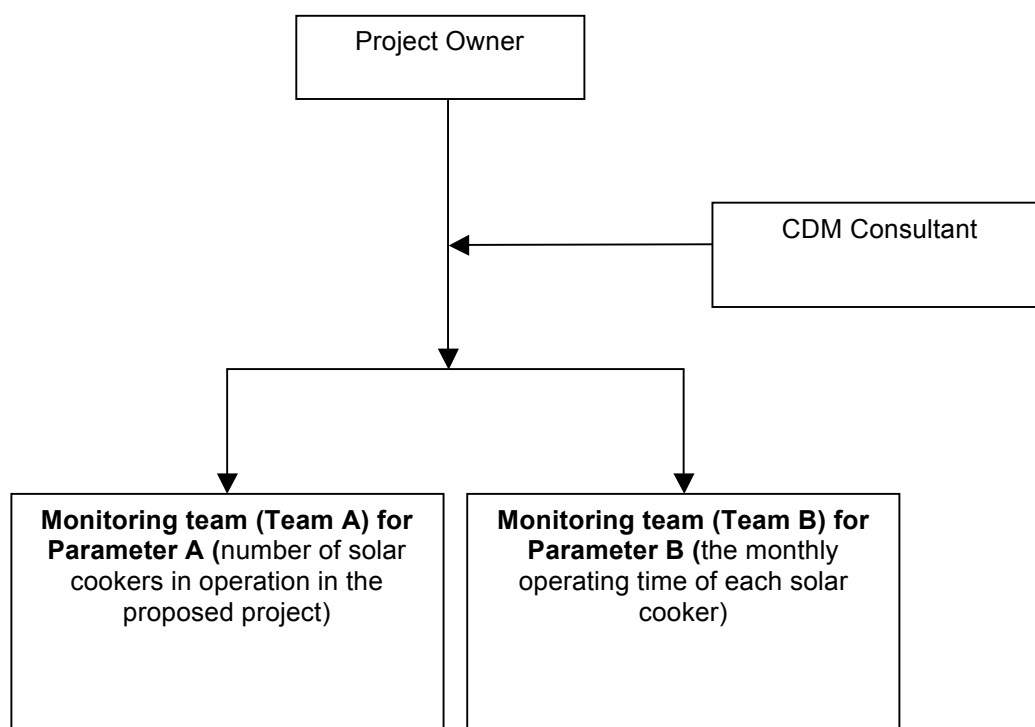
Parameter #3 and #4 in section 7.1 of the registered PDD are the data from reference documents which only need to be updated if there is an update on the latest available data. These two parameters are:

"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,CO_2} , 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,CO_2} 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 Stations¹ (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.

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

Monitoring Plan in PDD	Monitoring Process Implemented
<p>For number of solar cookers in operation in the proposed project (Parameter A):</p> <p>B.7.1 of PDD: 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.</p> <p>B.7.2 of PDD:</p> <ul style="list-style-type: none"> ● 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.² ● 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. ● 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. ● To track the solar cookers, the logo 	<p>For number of solar cookers in operation in the proposed project (Parameter A):</p> <p>The sales contracts have been presented to the verification team during the first verification. 49,000 solar cookers were ordered and installed initially.</p> <p>The logo of the project and the user name was put on each of the cookers during the distribution process.</p> <p>Since the length of this monitoring period is more than one year, to ensure the monitoring frequency to be at least once per year, the monitoring team conducted the monitoring of this parameter twice. Accordingly there were two sets of 79 sample users randomly selected using survey method with MS Excel software.</p> <p>The two monitoring activities for parameter A were conducted as the following:</p> <p>(1) the first one was during 17 September 2016 to 23 September 2016, for the period of 1 November 2015 to 31 October 2016 (sub-period 1), and</p> <p>(2) the second one was during 19 November 2016 to 26 November 2016, for the period of 1 November 2016 to 30 November 2016 (sub-period 2).</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</p>

² 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>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.</p> <ul style="list-style-type: none"> 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. 	<p>abovementioned sample users by team A. During the visit, 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><u>For the monthly operating time of each solar cooker (Parameter B):</u></p> <p>B.7.2 of PDD:</p> <ul style="list-style-type: none"> Sampling survey method will be used for the monitoring of parameter B. 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 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.³ Method of measurement: respondent self-reports, and operational logs. A monitoring team (Team B) will be set up to conduct the daily monitoring of the operating hours of the sample users. 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. 	<p><u>For the monthly operating time of each solar cooker (Parameter B):</u></p> <ul style="list-style-type: none"> Sampling survey method was used for the monitoring of parameter B. To be more conservative and to match the two sub-periods defined in the monitoring of parameter A in the previous paragraphs, two sets of 79 samples were randomly selected using MS Excel software as below: <ul style="list-style-type: none"> (1) the first set of 79 sample users was for the period of 1 November 2015 to 31 October 2016 (sub-period 1), and (2) the second set of 79 sample users was for the period of 1 November 2016 to 30 November 2016 (sub-period 2). 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 and record the data reported by the sampled users. <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.</p> <p>The quality of data was checked by the "RES" and project owner separately.</p>

³ Same as footnote 2

	Specifically, RES collected data from sampled users every day to guarantee data completeness and recorded data in accordance with the monitoring plan of PDD; RES also ensured the data records (numbers and dates, etc.) were legible and correct, and double-checked with sampled users for the data out of normal range. The project owner reviewed RES's data records and conducted reliability checking to ensure the precision of these data meet the requirement of PDD (For details on reliability checking, please refer to section D.3).
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SECTION D. Data and parameters

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

(Copy this table for each piece of data and parameter)

Data/parameter:	1.R
Unit	W/m ²
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
Choice of data or measurement methods and procedures	According to National Standard of P.R. China (GB), GB No.: NY/T219-2003, for calculating the rated power of solar cookers, 700 W/m ² should be used for as the standard value of solar irradiance rate.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter:	2. η
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%
Choice of data or measurement methods and procedures	This is the requirement of National Standard of P.R. China (GB), GB No.: NY/T219-2003. The project owner will also require in the technical specification that the solar cookers to be manufactured for this project have an efficiency of at least 65%.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter:	3. $\eta_{BL,thermal}$
Unit	N/A
Description	Thermal efficiency for the traditional coal furnace
Source of data	The highest value of measured data.
Value(s) applied)	14.6%

Choice of data or measurement methods and procedures	<p>According to paragraph 26 of methodology AMS-I.C.(version 18), for household cooking stoves, the efficiency of the baseline units can be determined by the highest measured operational efficiency over the full range of operating conditions of a representative sample of units with similar specifications.</p> <p>As a prestigious academic institution in Zhangye area, Hexi University (HXU) measured the efficiency of cooking stove in rural Zhangye. The thermal efficiencies of 100 representative cooking stoves at rural households of Zhangye were measured, and the measurement meets the requirements of Chinese National Standard "Test method for household coal and stoves" (GB 6412-2009).</p> <p>The measurement results are: the highest efficiency is 14.6%, the lowest efficiency is 9.8%, and the average is 12.6%.</p> <p>With the above measurement data, according to paragraph 22 of methodology AMS-I.C. (version 18), 14.6% shall be chosen as the baseline thermal efficiency for the coal stoves.</p>
Purpose of data	Calculation of baseline emissions
Additional comments	

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

Data/parameter:	1. n																																																										
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	<div>The following table shows the number of cookers in operation out of the 79 samples:</div> <table><tr><th rowspan="2">Township</th><th colspan="2">Number</th></tr><tr><th>Data obtained in sub-period 1 (01/11/2015 ~ 31/10/2016)</th><th>Data obtained in sub-period 2 (01/11/2016 ~ 30/11/2016)</th></tr><tr><td>Shahe</td><td>9</td><td>8</td></tr><tr><td>Xinhua</td><td>6</td><td>8</td></tr><tr><td>Banqiao</td><td>6</td><td>5</td></tr><tr><td>Pingchuan</td><td>2</td><td>6</td></tr><tr><td>Liaoquan</td><td>7</td><td>4</td></tr><tr><td>Yanuan</td><td>9</td><td>10</td></tr><tr><td>Nijiaying</td><td>5</td><td>6</td></tr><tr><td>Xiangdao</td><td>7</td><td>5</td></tr><tr><td>Heli</td><td>6</td><td>7</td></tr><tr><td>Nanhua</td><td>5</td><td>6</td></tr><tr><td>Xinba</td><td>1</td><td>0</td></tr><tr><td>Luotuocheng</td><td>7</td><td>5</td></tr><tr><td>Xuanhua</td><td>6</td><td>6</td></tr><tr><td>Heiquan</td><td>3</td><td>2</td></tr><tr><td>Luocheng</td><td>0</td><td>1</td></tr><tr><td>Total number of cookers in operation out of the 79 sample users</td><td>79</td><td>79</td></tr><tr><td>Percentage of cookers in operation out of 79 sample users</td><td>100%</td><td>100%</td></tr></table>			Township	Number		Data obtained in sub-period 1 (01/11/2015 ~ 31/10/2016)	Data obtained in sub-period 2 (01/11/2016 ~ 30/11/2016)	Shahe	9	8	Xinhua	6	8	Banqiao	6	5	Pingchuan	2	6	Liaoquan	7	4	Yanuan	9	10	Nijiaying	5	6	Xiangdao	7	5	Heli	6	7	Nanhua	5	6	Xinba	1	0	Luotuocheng	7	5	Xuanhua	6	6	Heiquan	3	2	Luocheng	0	1	Total number of cookers in operation out of the 79 sample users	79	79	Percentage of cookers in operation out of 79 sample users	100%	100%
Township	Number																																																										
	Data obtained in sub-period 1 (01/11/2015 ~ 31/10/2016)	Data obtained in sub-period 2 (01/11/2016 ~ 30/11/2016)																																																									
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Pingchuan	2	6																																																									
Liaoquan	7	4																																																									
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Total number of cookers in operation out of the 79 sample users	79	79																																																									
Percentage of cookers in operation out of 79 sample users	100%	100%																																																									

	<table><tr><td>Total number of operational cookers based on sample user result</td><td>49000</td><td>49000</td></tr></table>	Total number of operational cookers based on sample user result	49000	49000
Total number of operational cookers based on sample user result	49000	49000		
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">● Before implementing the project, the personnel of monitoring teams were trained on how to properly conduct the monitoring process.● 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.● 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.● For missing or damaged data record, zero value is used for the missing or damaged data, which is the most conservative approach.			
Purpose of data:	Calculation of baseline emissions			
Additional comments:	Records were kept in electronic form and paper form.			

Data/parameter:	2. t_i																										
Unit	Hour																										
Description	The monthly operating time of each solar cooker																										
Measured/calculated/default	Measured and calculated.																										
Source of data	Monitoring result of the usage time of the sampled cookers selected by the sampling survey																										
Value(s) of monitored parameter	<table> <tr><td>Nov-2015</td><td>137.19</td></tr> <tr><td>Dec-2015</td><td>141.06</td></tr> <tr><td>Jan-2016</td><td>125.76</td></tr> <tr><td>Feb-2016</td><td>137.53</td></tr> <tr><td>Mar-2016</td><td>131.12</td></tr> <tr><td>Apr-2016</td><td>137.60</td></tr> <tr><td>May-2016</td><td>126.18</td></tr> <tr><td>Jun-2016</td><td>151.11</td></tr> <tr><td>Jul-2016</td><td>131.21</td></tr> <tr><td>Aug-2016</td><td>82.13</td></tr> <tr><td>Sep-2016</td><td>133.44</td></tr> <tr><td>Oct-2016</td><td>139.37</td></tr> <tr><td>Nov-2016</td><td>137.99</td></tr> </table>	Nov-2015	137.19	Dec-2015	141.06	Jan-2016	125.76	Feb-2016	137.53	Mar-2016	131.12	Apr-2016	137.60	May-2016	126.18	Jun-2016	151.11	Jul-2016	131.21	Aug-2016	82.13	Sep-2016	133.44	Oct-2016	139.37	Nov-2016	137.99
Nov-2015	137.19																										
Dec-2015	141.06																										
Jan-2016	125.76																										
Feb-2016	137.53																										
Mar-2016	131.12																										
Apr-2016	137.60																										
May-2016	126.18																										
Jun-2016	151.11																										
Jul-2016	131.21																										
Aug-2016	82.13																										
Sep-2016	133.44																										
Oct-2016	139.37																										
Nov-2016	137.99																										
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"> The usage time of cookers were measured and recorded daily. At the end of each month, all the daily data of the past month were summarized to produce the monthly usage time. 																										
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;																										

	<p>(2) Sum up the monthly usage time of all the 79 users to get the total monthly usage time of the 79 users.</p> <p>(3) Divide the number obtained in (2) by 79 to get the average monthly operating time of each solar cooker.</p>
QA/QC procedures:	<p>To ensure the completeness of data, monitoring forms were filled out daily by the monitoring team to record the daily usage data of the sample users. The sampled users and monitoring team were properly trained to collect and record the data strictly according to the monitoring plan of PDD. The data records were checked to ensure the legibility and correctness. The sampled users were requested to further explain the reasons for the data out of normal range (for details, please refer to item 5 of the next subsection "Process conducted for data records that are missing, damaged, or out of normal range"). Reliability checking was performed to ensure the data precision meet requirement of PDD.</p> <p>Process conducted for data records that are missing, damaged, or out of normal range:</p> <ol style="list-style-type: none"> 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. 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; 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; 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; 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.
Purpose of data:	Calculation of baseline emissions
Additional comments:	Records were kept in electronic form and paper form.

Data/parameter:	3.R_i
Unit	W/m ²
Description	Monthly solar irradiance rate in project region
Measured/calculated/default	Measured
Source of data	Gansu Meteorological Service Centre (latest available data ⁴ released on 25 Nov. 2013, which is suitable to be applied.)

⁴ 1996-2011 solar irradiance data

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 comments:																											

Data/parameter:	4.EF_{FF,CO2}
Unit	tCO ₂ /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
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The data is from an official source (latest information from IPCC); there is no updated data available. No additional QA/QC procedure is necessary.
Purpose of data:	Calculation of baseline emissions
Additional comments:	

D.3. Implementation of sampling plan

>>

>>

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). Since the monitoring period is more than one year, to be conservative, for each parameter, two sets of 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 79 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, for both 1st and 2nd sample set: $n=79$, $p^{\wedge}=1$

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 precisions of the data for 1st and 2nd sample sets are both 1.68%, both 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” (EB67, Annex 6) appendix 4, paragraph 11-17, confidence/precision should be checked following the steps below:

(i) 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.

Let s_1 denote the standard deviation of the monthly usage hours per user of the first sample set, and s_2 denote the standard deviation of the monthly usage hours per user of the second sample set.

Using Excel, we can calculate the value of s_1 and s_2 as well as the mean value of the two sample sets as below:

$$s_1 = 16.9561$$

$$s_2 = 4.7020$$

Mean value of monthly usage hours per user (for 1st sample set) = 131.1417

Mean value of monthly usage hours per user (for 2nd sample set) = 137.9937

Putting all these pieces of information together gives:

$$\text{Standard error of the mean (for 1st sample set)} = \sqrt{\left(1 - \frac{79}{49000}\right) \cdot \frac{s_1^2}{79}} = 1.9062$$

$$\text{Standard error of the mean (for 2nd sample set)} = \sqrt{\left(1 - \frac{79}{49000}\right) \cdot \frac{s_2^2}{79}} = 0.5286$$

(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 precisions of the monthly usage (in hours) per user, assuming 90% confidence, are therefore:

for 1st sample set: $\pm (1.6646 \times 1.9062) = \pm 3.1731$

for 2nd sample set: $\pm (1.6646 \times 0.5286) = \pm 0.8799$.

The ratios of this relative to the mean monthly usage per user are:

for 1st sample set: $3.1731/131.1417 = 2.42\%$,

for 1st sample set: $0.8799/139.9937 = 0.64\%$.

Therefore, the relative precision of the data over the monitoring period for the 1st and 2nd sample set are 2.42% and 0.64% respectively, both 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

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

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

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 value adopted is 49,000 (refer to parameter #1 in table D.2 for details).
- EF_{FF,CO_2} The CO₂ emission factor of coal (tCO₂e/ TJ). IPCC default emission factor of 94.6tCO₂e/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:

From 01/11/2015 to 31/10/2016:

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	$BE_i = HG_i \cdot EF_{FF,CO_2} / \eta_{BL, thermal}$ Equation (5) in PDD
		(W/m ²)	(W)	(hour)	(TJ)	(tCO ₂ e)
2015-11	01/11/2015 – 30/11/2015	410.8	534.0	137.19	12.92404	8374
2015-12	01/12/2015 – 31/12/2015	363.0	471.9	141.06	11.74208	7608
2016-01	01/01/2016 – 31/01/2016	408.7	531.3	125.76	11.78615	7637
2016-02	01/02/2016 – 29/02/2016	503.4	654.4	137.53	15.87644	10287
2016-03	01/03/2016 – 31/03/2016	635.1	825.6	131.12	19.09681	12374
2016-04	01/04/2016 – 30/04/2016	738.5	960.1	137.60	23.30220	15099
2016-05	01/05/2016 – 31/05/2016	799.7	1039.6	126.18	23.13979	14993
2016-06	01/06/2016 – 30/06/2016	814.4	1058.7	151.11	28.22137	18286
2016-07	01/07/2016 – 31/07/2016	829.2	1078.0	131.21	24.95073	16167
2016-08	01/08/2016 – 31/08/2016	767.8	998.1	82.13	14.46122	9370

2016-09	01/09/2016 – 30/09/2016	696.3	905.2	133.44	21.30698	13806
2016-10	01/10/2016 – 31/10/2016	537.1	698.2	139.37	17.16600	11123

Using Equation (4) in PDD, total Baseline Emissions in the part 1 (01/11/2015 to 31/10/2016) of the monitoring period = $\sum BE_i = 145,122 \text{ tCO}_2\text{e}$.

From 01/11/2016 to 30/11/2016:

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	$BE_i = HG_i \cdot EF_{FF,CO2} / \eta_{BL, thermal}$ Equation (5) in PDD
		(W/m ²)	(W)	(hour)	(TJ)	(tCO ₂ e)
2016-11	01/11/2016 – 30/11/2016	410.8	534.0	137.99	12.99965	8423

Using Equation (4) in PDD, total Baseline Emissions in the part 2 (01/11/2016 to 30/11/2016) of the monitoring period = $\sum BE_i = 8,423 \text{ tCO}_2\text{e}$.

Using Equation (4) in PDD, total Baseline Emissions in the monitoring period is:
 $145,122 + 8,423 = 153,545 \text{ tCO}_2\text{e}$

Therefore, the total Baseline Emissions generated in the monitoring period is **153,545 tCO₂e**.

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 GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	153,545	0	0	0	153,545	153,545

E.5. Comparison of actual emission reductions or net 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
Emission reductions or GHG removals by sinks (t CO ₂ e)	151.660	153,545

CERs estimated in ex-ante calculation of registered PDD

Month	Time Interval	Monthly CERs in registered PDD (tCO ₂ e)
2015-11	01/11/2015 – 30/11/2015	7898
2015-12	01/12/2015 – 31/12/2015	6997
2016-01	01/01/2016 – 31/01/2016	7848
2016-02	01/02/2016 – 29/02/2016	9641
2016-03	01/03/2016 – 31/03/2016	12206
2016-04	01/04/2016 – 30/04/2016	14159
2016-05	01/05/2016 – 31/05/2016	15274
2016-06	01/06/2016 – 30/06/2016	15527
2016-07	01/07/2016 – 31/07/2016	15796
2016-08	01/08/2016 – 31/08/2016	14688
2016-09	01/09/2016 – 30/09/2016	13381
2016-10	01/10/2016 – 31/10/2016	10346
2016-11	01/11/2016 – 30/11/2016	7898
Total		151,660

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

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The actual monitored emission reduction (ER) is 153,545 tCO₂e, which is slightly higher than the estimated 151,660 tCO₂e 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 actual average monthly usage time of the entire monitoring period is 131.5⁵ hours. The estimated monthly usage time in PDD is 129.3 hours.). The difference between the actual ER value and estimated value is reasonable.

⁵ The monitoring period covers totally 396 days, and an average month in a year has 365/12 days. The total usage time during the monitoring period is 1711.69 hours. Therefore, the average monthly usage time during the monitoring period is 1711.69/ [396/ (365/12)] = 131.5 hours.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Beijing Harmonious Energy Development Co., Ltd.
Street/P.O. Box	No. 8 Ronghua Middle Road
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Direct tel.	
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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
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 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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		