

**MONITORING REPORT FORM (F-CDM-MR)  
Version 02.0****MONITORING REPORT**

<b>Title of the project activity</b>	Federal Intertrade Haiyuan Solar Cooker Project
<b>Reference number of the project activity</b>	3520
<b>Version number of the monitoring report</b>	3.1
<b>Completion date of the monitoring report</b>	09/12/2012
<b>Registration date of the project activity</b>	15/09/2010
<b>Monitoring period number and duration of this monitoring period</b>	1 <sup>st</sup> 15/09/2010 -31/08/2012 (both days included)
<b>Project participant(s)</b>	Ningxia Federal Intertrade Co., Ltd. Swiss Re Global Markets Limited Post 2012 Carbon Credit Fund CV
<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 14, EB46 - 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>	65,544 tCO <sub>2</sub> e
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	64,738 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 17,000 solar cookers for the poor rural residents in north-western China. The rating power of each solar cooker is 773.5W and the total capacity of the project is 13.1495 MW. 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 registration by placing order, arrangement for distribution of cookers and training of the monitoring team members, etc. The solar cookers started generating emission reductions since 2/11/2010, which means that project operation commenced on 02/11/2010. The operation period for the project is 02/11/2010 - 31/8/2012 which is in this first monitoring period. The total emission reductions achieved in this monitoring period is 64,738 tCO<sub>2</sub>e.

### A.2. Location of project activity

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The Project is located in 16 townships (Shidian, Lijun, Jiucui, Shutai, Zhengqi, Jiatang, Caowa, Hongyang, Guanzhuang, Xian, Haicheng, Guanqiao, Liwang, Gancheng, Sanhe, Qiyong) in Haiyuan County, Ningxia Hui Autonomous Region, China. The approximate locations of the centers of the townships in which the project is located are:

Township name	Location of township center
Shidian	36°31'47.00"N 105°41'7.00"E
Lijun	36°13'47.03"N 105°52'40.26"E
Jiucui	36°17'21.73"N 105°54'21.69"E
Shutai	36°30'2.07"N 105°26'14.80"E
Zhengqi	36°26'51.75"N 105°57'25.60"E
Jiatang	36°31'14.70"N 105°49'20.96"E
Caowa	36°25'27.34"N 105°45'1.49"E
Hongyang	36°15'45.52"N 105°37'10.75"E
Guanzhuang	36°16'59.04"N 105°33'1.56"E
Xian	36°35'43.43"N 105°28'33.37"E
Haicheng	36°33'32.78"N 105°38'36.85"E
Guanqiao	36°46'46.49"N 105°47'25.30"E
Liwang	36°40'4.71"N 106°06'25.22"E
Gancheng	36°35'8.26"N 106°20'34.13"E
Sanhe	36°22'13.84"N 106°05'33.08"E
Qiyong	36°30'10.39"N 106°09'17.69"E

Each of the 17,000 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)	Ningxia Federal Intertrade Co., Ltd.	No
Netherlands	Swiss Re Global Markets Limited	No
Switzerland	Post 2012 Carbon Credit Fund CV	No

**A.4. Reference of applied methodology**

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Small-scale CDM baseline methodology “AMS-I.C.(Version 14, EB46), 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: 15/09/2010-14/09/2020

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 registration (15/09/2010), and the project started generating emission reductions on 2/11/2010. This means that the starting date of the project operation was 2 November 2010, which was in this first monitoring period of the project. 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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The distribution of solar cookers was extended to 6 additional townships (which were not included in the registered PDD) in the same (Haiyuan) County.

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

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None

**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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According to methodology AMS-I.C. (Version 14, EB46) and the registered PDD, the following two parameters were monitored:

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

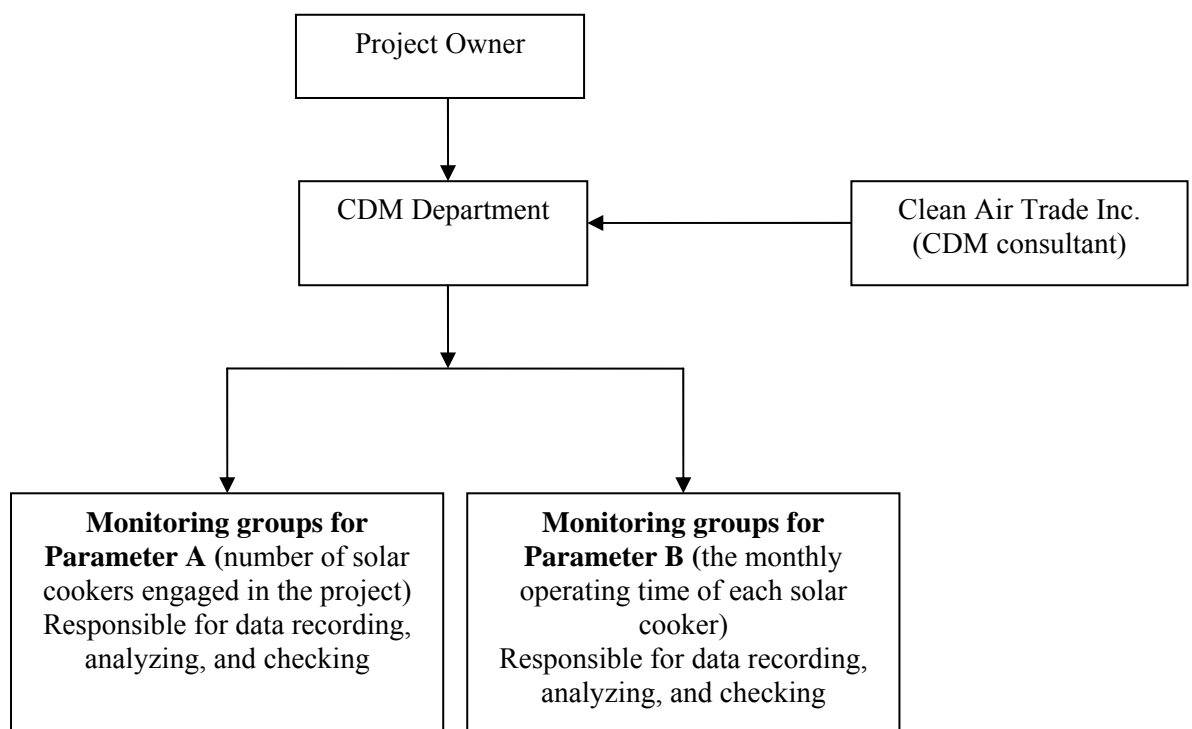
Monitoring Plan in PDD	Monitoring Process Implemented
<p><b><u>For number of solar cookers engaged in the proposed project (Parameter A):</u></b></p> <p><b>B7.1 of PDD:</b> The initial value of this parameter will be determined by the sales contract of the solar cookers and then this parameter will be monitored, recorded, and archived annually.</p> <p><b>B7.2 of PDD:</b> The monitoring of total number of operating solar cookers will be conducted annually during the last quarter of each year. A checklist will be used for monitoring and recording this parameter.</p> <p>To track the solar cookers, the logo of the project was put on each of the solar cookers distributed to the users.</p>	<p><b><u>For number of solar cookers engaged in the proposed project (Parameter A):</u></b></p> <p>The sales contract has been presented to the verification team during the first verification. 17,000 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>The monitoring of this parameter was conducted by monitoring team A. Team A consisted of 5 groups, and each group consisted of 2 persons (one from Rural Energy Station of the Bureau of Agriculture and Graze of Haiyuan County (Hereinafter “Haiyuan County Rural Energy Station” or “HRES”) and the other from Ningxia Federal Intertrade Co., Ltd.). The monitoring of this parameter involved visiting each of the 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 by monitoring personnel.</p> <p>After the visit to households, the monitoring results were recorded in the monitoring table shown in PDD section B7.2.Clause 3. Then all the operational cookers were summed up to generate the total number of cookers in</p>



	<p>operation. All the monitoring data were collected, recorded and confirmed by the monitoring team and the head of HRES, and then provided the records to the project owner.</p> <p>During the current monitoring period, team A has conducted the abovementioned monitoring of this parameter twice during the following two periods:</p> <p>(1) From July 15, 2011 to August 25, 2011, and</p> <p>(2) From July 10, 2012 to August 25, 2012,</p>
<p><b><u>For the monthly operating time of each solar cooker (Parameter B):</u></b></p> <p><b>B7.2 of PDD:</b></p> <ul style="list-style-type: none"> <li>● Sampling survey will be utilized in the monitoring. 79 sample users will be randomly selected from the 16 townships within the project boundary.</li> <li>● A number of CDM groups will be set up to conduct the daily monitoring of the operating hours of the sampled users. Each CDM group will consist of 1~5 people and each person will be responsible for the monitoring and recording of 5~20 sampled users. The monitoring forms will be filled out daily by the CDM group.</li> <li>● At least once a month the monitoring form will be collected and the quality of data will be checked. At least once a month, the CDM group will choose one family and stay for an entire day in this family' home to monitor the detailed usage of the solar cooker.</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 and two sets of 79 samples were randomly selected from 17,000 solar cooker users using “Random” function in MS Excel software as below: <ul style="list-style-type: none"> <li>(1) The first set of 79 sample users was selected in October 2010 and monitored from November 2, 2010 to August 31, 2011; and</li> <li>(2) the second set of 79 sample users was selected in August 2011 and monitored from September 1, 2011 to August 31, 2012.</li> </ul> </li> <li>● There were 2 CDM groups (each consists of 1 person) monitoring this parameter and they record the operating hours of the sample users in monitoring forms. Please note that the number of users each monitoring person handled is more than 5~20 users as planned in PDD, because the ways of collecting data has been diversified – the monitoring personnel used phone call, SMS message, or visited the user face-to-face to get the data, which significantly improved the efficiency.</li> <li>● At the end of each month during the monitoring period, the monitoring form</li> </ul>

	<p>was collected and the paper documents were converted into electronic form and archived. The quality of data was checked by the “HRES” and Ningxia Federal Intertrade Co. separately.</p> <ul style="list-style-type: none"><li>● In each month of the monitoring period, the monitoring team chose one family and recorded the detailed usage of the solar cooker at this family throughout the day. The purpose of such visit is to double check if the usage time the users reported is within the reasonable range and also whether the users understand the procedure and approach for the reporting of usage time of solar cookers.</li></ul>
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The organization structure of the monitoring system is the following:



#### Roles and Responsibilities:

The monitoring process is conducted through the coordination between the project owner and Haiyuan County Rural Energy Station (HRES), the governmental organization in charge of the rural energy affairs. The project owner is responsible for overall management of the entire monitoring process. Under the project owner, there is a CDM Department which consists of groups for the monitoring of parameter A (number of solar cookers engaged in the project) and parameter B (the monthly operating time of each solar cooker).

CDM Department is responsible for data recording, analyzing, checking and archiving, Clean Air Trade Inc. (CDM consultant) is responsible for overseeing and advising the monitoring process as well as final data checking. As the governmental organization in charge of the rural energy affairs, HRES is responsible for the raw data collection and recording, and all the raw data were confirmed by HRES. The project owner is responsible for data analyzing, checking, and archiving.

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.

## SECTION D. Data and parameters

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

<b>Data/Parameter</b>	1.EF CO <sub>2</sub>
<b>Unit</b>	tCO <sub>2</sub> /TJ
<b>Description</b>	Baseline emission factor of Coal
<b>Source of data</b>	IPCC2006, page 2.22, Table2.5
<b>Value(s) applied</b>	94.6
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	There was no national or regional data available. Thus, IPCC default value was used.

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

<b>Data / Parameter</b>	3.R <sub>i</sub>																										
<b>Unit</b>	W/m <sup>2</sup>																										
<b>Description</b>	Monthly solar irradiance rate in project region																										
<b>Source of data</b>	Ningxia Meteorological Archives																										
<b>Value(s) applied</b>	<table border="1"> <thead> <tr> <th><u>Month</u></th> <th><u>Value</u></th> </tr> </thead> <tbody> <tr><td>1</td><td>388.5</td></tr> <tr><td>2</td><td>451.2</td></tr> <tr><td>3</td><td>532.1</td></tr> <tr><td>4</td><td>593.0</td></tr> <tr><td>5</td><td>673.4</td></tr> <tr><td>6</td><td>720.6</td></tr> <tr><td>7</td><td>678.5</td></tr> <tr><td>8</td><td>604.0</td></tr> <tr><td>9</td><td>594.1</td></tr> <tr><td>10</td><td>566.4</td></tr> <tr><td>11</td><td>373.4</td></tr> <tr><td>12</td><td>367.0</td></tr> </tbody> </table>	<u>Month</u>	<u>Value</u>	1	388.5	2	451.2	3	532.1	4	593.0	5	673.4	6	720.6	7	678.5	8	604.0	9	594.1	10	566.4	11	373.4	12	367.0
<u>Month</u>	<u>Value</u>																										
1	388.5																										
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10	566.4																										
11	373.4																										
12	367.0																										
<b>Purpose of data</b>	Calculation of baseline emissions																										
<b>Additional comment</b>																											

<b>Data / Parameter</b>	4.A
<b>Unit</b>	m <sup>2</sup>
<b>Description</b>	Solar cooker's light-collecting area
<b>Source of data</b>	Project owner(technical specification of the solar cooker)
<b>Value(s) applied</b>	1.7
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	

<b>Data / Parameter</b>	5. $\eta$
<b>Unit</b>	N/A
<b>Description</b>	Solar cooker's thermal efficiency
<b>Source of data</b>	Solar cooker testing report from Ningxia Department of Agriculture and Graze, Rural Energy Station and manufacturer's confirmation letter.
<b>Value(s) applied</b>	65%
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	

<b>Data / Parameter</b>	6. $\eta_{th}$
<b>Unit</b>	N/A
<b>Description</b>	Thermal efficiency for the traditional coal furnace
<b>Source of data</b>	<p>1) The on-site measurement data of thermal efficiency of rural coal stoves in Ningxia by the Energy Saving Monitoring Technical Service Center of Ningxia Hui Autonomous Region, the provincial authority in charge of collecting and monitoring energy usage data in Ningxia.</p> <p>2)“Clean Energy for Development and Economic Growth: Biomass and Other Renewable Energy Options to Meet Energy and Development Needs in Poor Nations”, United Nations Development Programme (UNDP), 2002  <a href="http://www.undp.org/energy/publications/2002/2002b.htm">http://www.undp.org/energy/publications/2002/2002b.htm</a></p>
<b>Value(s) applied</b>	15%
<b>Purpose of data</b>	Calculation of baseline emissions
<b>Additional comment</b>	

#### D.2. Data and parameters monitored

<b>Data/Parameter</b>	1. <i>n</i>				
<b>Unit</b>	Not applicable				
<b>Description</b>	Number of solar cookers engaged in the proposed project				
<b>Measured/Calculated /Default</b>	Measured.				
<b>Source of data</b>	Sales contract and invoice of the solar cookers and monitoring records of monitoring team				
<b>Value(s) of monitored parameter</b>	<p>The following table shows the number of cookers in operation in each township:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Township</th> <th style="text-align: center;">Number</th> </tr> </thead> <tbody> <tr> <td style="height: 20px;"></td> <td style="width: 150px;"></td> </tr> </tbody> </table>	Township	Number		
Township	Number				

	Data obtained by 1st monitoring sub-period (for 15/09/2010 ~ 31/08/2011)	Data obtained by 2nd monitoring sub-period (for 01/09/2011 ~ 31/08/2012)
Shidian	1412	1412
Lijun	290	290
Jucai	315	315
Shutai	1141	1141
Zhengqi	701	701
Jiatang	629	629
Caowa	1178	1178
Hongyang	401	401
Guanzhuang	686	686
Xian	1897	1897
Haicheng	1285	1285
Guanqiao	1208	1208
Liwang	2008	2008
Gancheng	576	574
Sanhe	1096	1096
Qiyong	2177	2176
<b>Total</b>	<b>17000</b>	<b>16997</b>
	<p>For the 2<sup>nd</sup> monitoring sub-period, when monitoring team A visited the solar cooker users, there were 3 households with nobody at home. Therefore, the monitoring team could not enter the houses to check the solar cookers. Following conservative principle, the monitoring team did not include these 3 solar cookers into the total number of solar cookers. Therefore, the monitoring result of this monitored parameter for the 2<sup>nd</sup> monitoring sub-period is 17,000 – 3 = 16,997.</p> <p>In summary, the monitoring results of this monitored parameter for the 1<sup>st</sup> sub-period and the 2<sup>nd</sup> monitoring sub-period are 17,000 and 16,997 respectively.</p>	
<b>Monitoring equipment</b>	Monitoring equipment is not necessary, and thus not used.	
<b>Measuring/Reading/Recording frequency</b>	Annually (Has been monitored twice during this monitoring period)	
<b>Calculation method (if applicable)</b>	Not applicable	
<b>QA/QC procedures</b>	<ul style="list-style-type: none"> <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>	
<b>Purpose of data</b>	Calculation of baseline emission	



<b>Additional comment</b>	Records were kept in electronic form and paper form.																																																	
<b>Data/Parameter</b>	2. $t_i$																																																	
<b>Unit</b>	Hour																																																	
<b>Description</b>	The monthly operating time of each solar cooker																																																	
<b>Measured/Calculated /Default</b>	Measured and calculated.																																																	
<b>Source of data</b>	Usage time measured and recorded by the project monitoring team																																																	
<b>Value(s) of monitored parameter</b>	<table border="1"> <tbody> <tr><td>Sep-2010</td><td>0</td></tr> <tr><td>Oct-2010</td><td>0</td></tr> <tr><td>Nov-2010</td><td>98.36</td></tr> <tr><td>Dec-2010</td><td>151.95</td></tr> <tr><td>Jan-2011</td><td>127.35</td></tr> <tr><td>Feb-2011</td><td>118.36</td></tr> <tr><td>Mar-2011</td><td>134.10</td></tr> <tr><td>Apr-2011</td><td>137.34</td></tr> <tr><td>May-2011</td><td>130.13</td></tr> <tr><td>Jun-2011</td><td>123.30</td></tr> <tr><td>Jul-2011</td><td>128.69</td></tr> <tr><td>Aug-2011</td><td>124.11</td></tr> <tr><td>Sep-2011</td><td>81.57</td></tr> <tr><td>Oct-2011</td><td>129.89</td></tr> <tr><td>Nov-2011</td><td>104.93</td></tr> <tr><td>Dec-2011</td><td>144.17</td></tr> <tr><td>Jan-2012</td><td>136.58</td></tr> <tr><td>Feb-2012</td><td>132.70</td></tr> <tr><td>Mar-2012</td><td>126.83</td></tr> <tr><td>Apr-2012</td><td>133.93</td></tr> <tr><td>May-2012</td><td>141.52</td></tr> <tr><td>Jun-2012</td><td>142.87</td></tr> <tr><td>Jul-2012</td><td>130.25</td></tr> <tr><td>Aug-2012</td><td>116.78</td></tr> </tbody> </table>		Sep-2010	0	Oct-2010	0	Nov-2010	98.36	Dec-2010	151.95	Jan-2011	127.35	Feb-2011	118.36	Mar-2011	134.10	Apr-2011	137.34	May-2011	130.13	Jun-2011	123.30	Jul-2011	128.69	Aug-2011	124.11	Sep-2011	81.57	Oct-2011	129.89	Nov-2011	104.93	Dec-2011	144.17	Jan-2012	136.58	Feb-2012	132.70	Mar-2012	126.83	Apr-2012	133.93	May-2012	141.52	Jun-2012	142.87	Jul-2012	130.25	Aug-2012	116.78
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<b>Monitoring equipment</b>	<p>Clock or watch</p> <p>No calibration requirement is specified in the registered PDD and the applied Methodology AMS-I.C version 14.</p>																																																	
<b>Measuring/Reading/Recording frequency</b>	<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>																																																	
<b>Calculation method (if applicable)</b>	<p>(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> <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>																																																	



	(3) Divide the number obtained in (2) by 79 to get the average monthly operating time of each solar cooker.
<b>QA/QC procedures</b>	<p>Before implementing the project, Ningxia Federal Intertrade Co., Ltd. trained the personnel of monitoring teams 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, Ningxia Federal Intertrade Co., the project owner, has the right to require that HRES create new monitoring team according to the requirement of Ningxia Federal Intertrade Co.</li> <li>5. If the data reported by the user significantly higher than the normal range, the monitoring personnel should ask 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>
<b>Purpose of data</b>	Calculation of baseline emission
<b>Additional comment</b>	Records were kept in electronic form and paper form.

### D.3. Implementation of sampling plan

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According to the registered PDD, simple random sampling (with sample of 79) was used for the monitoring of the average monthly usage time of cookers (Parameter B). Since the monitoring period is almost 2 years, two sets of 79 sample users were randomly selected from 17,000 solar cooker users within the project boundary (the first set was selected in Oct 2010, and the second set was selected in Aug 2011), The average monthly usage time per user was calculated based on data obtained from the above-mentioned sample users (for details, please refer to section D.2, parameter#2,  $t_i$ ).

According to “GUIDELINES FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES” EB69, Annex 5, paragraph 229-232, 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 = 17000, thus,  $f = 79/17000 = 0.00465$

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:

$$s_1 = 15.5736$$

$$s_2 = 17.5759$$

Mean value of monthly usage hours per user (for 1st sample set) = 127.3699

Mean value of monthly usage hours per user (for 2nd sample set) = 126.8360

Putting all these pieces of information together gives:

$$\text{Standard error of the mean (for 1st sample set)} = \sqrt{\left(1 - \frac{79}{17000}\right) \times \frac{s_1^2}{79}} = 1.7481$$

$$\text{Standard error of the mean (for 2nd sample set)} = \sqrt{\left(1 - \frac{79}{17000}\right) \times \frac{s_2^2}{79}} = 1.9728$$

(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  $\times$  standard error of the mean.

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

$$\text{For 1st sample set: } \pm (1.6646 \times 1.7481) = \pm 2.9099,$$

$$\text{For 2nd sample set: } \pm (1.6646 \times 1.9728) = \pm 3.2841.$$

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

$$\text{For 1st sample set: } 2.9099/127.3699 = 0.0228,$$

$$\text{For 2nd sample set: } 3.2841/126.8360 = 0.0259$$

Therefore, the relative precisions of the data over the monitoring period for the 1<sup>st</sup> and 2<sup>nd</sup> sample set are 2.28% and 2.59%, 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

>>

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

$$BE_y = n * \sum [773.5 * (R_i / 700) * t_i * 3.6 \times 10^{-9}] * EF_{CO_2} / \eta_{th} \quad (i = 1, 2, \dots, 12)$$

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.1
- $t_i$   $t_i$  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 are 17,000 and 16,997 respectively (refer to parameter #1 in table D.2 for details).
- $EF_{CO_2}$  The  $CO_2$  emission factor of coal (t $CO_2e$ / TJ). IPCC default emission factor of 94.6t $CO_2e$ /TJ will be adopted in the proposed project.
- $\eta_{th}$  The efficiency of the coal-fired stove that would have been used in the absence of project activity. The value adopted is 15%

The result is summarized in the tables below:

**From 15/09/2010 to 31/08/2011:**

Month	Time Interval	Solar irradiance rate	Actual Power of Solar Cooker	Monthly Usage Time	Net Heat Supplied Monthly	CER Generated Monthly
		$R_i$	$P_i$ = $773.5 * (R_i / 700)$ Equation (8) in PDD	$t_i$	$HG_i$ = $n * [P_i * t_i * (3.6 \times 10^{-9})]$ Equation (6) in PDD	$BE_i$ = $HG_i * EF_{CO_2} / \eta_{th}$ Equation (5) in PDD
		( $W/m^2$ )	(W)	(hour)	(TJ)	(t $CO_2e$ )
2010-09	15/09/2010 – 30/09/2010	594.1	656.5	0	0	0
2010-10	01/10/2010 –	566.4	625.9	0	0	0



	31/10/2010					
2010-11	01/11/2010 – 30/11/2010	373.4	412.6	98.36	2.48380	1566
2010-12	01/12/2010 – 31/12/2010	367.0	405.5	151.95	3.77123	2378
2011-01	01/01/2011 – 31/01/2011	388.5	429.3	127.35	3.34572	2110
2011-02	01/02/2011 – 28/02/2011	451.2	498.6	118.36	3.61163	2278
2011-03	01/03/2011 – 31/03/2011	532.1	588.0	134.10	4.82529	3043
2011-04	01/04/2011 – 30/04/2011	593.0	655.3	137.34	5.50777	3474
2011-05	01/05/2011 – 31/05/2011	673.4	744.1	130.13	5.92621	3737
2011-06	01/06/2011 – 30/06/2011	720.6	796.3	123.30	6.00881	3790
2011-07	01/07/2011 – 31/07/2011	678.5	749.7	128.69	5.90474	3724
2011-08	01/08/2011 – 31/08/2011	604.0	667.4	124.11	5.06941	3197

Using Equation (4) in PDD, total Baseline Emissions in the part 1 (15/09/2010 to 31/08/2011) of the monitoring period =  $\sum BE_i = 29,297 \text{ tCO}_2\text{e}$

**From 01/09/2011 to 31/08/2012:**

Month	Time Interval	Solar irradiance rate	Actual Power of Solar Cooker	Monthly Usage Time	Net Heat Supplied Monthly	CER Generated Monthly
		$R_i$	$P_i$ = $773.5 \cdot (R_i/700)$ 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	$BE_i$ = $HG_i \cdot EF_{CO_2} / \eta_{th}$ Equation (5) in PDD
		(W/m <sup>2</sup> )	(W)	(hour)	(TJ)	(tCO <sub>2</sub> e)
2011-09	01/09/2011 – 30/09/2011	594.1	656.5	81.57	3.27676	2067
2011-10	01/10/2011 – 31/10/2011	566.4	625.9	129.89	4.97420	3137
2011-11	01/11/2011 – 30/11/2011	373.4	412.6	104.93	2.64906	1671
2011-12	01/12/2011 – 31/12/2011	367.0	405.5	144.17	3.57760	2256



	31/12/2011					
2012-01	01/01/2012	388.5	429.3	136.58	3.58772	2263
	31/01/2012					
2012-02	01/02/2012	451.2	498.6	132.70	4.04849	2553
	29/02/2012					
2012-03	01/03/2012	532.1	588.0	126.83	4.56305	2878
	31/03/2012					
2012-04	01/04/2012	593.0	655.3	133.93	5.37011	3387
	30/04/2012					
2012-05	01/05/2012	673.4	744.1	141.52	6.44355	4064
	31/05/2012					
2012-06	01/06/2012	720.6	796.3	142.87	6.96123	4390
	30/06/2012					
2012-07	01/07/2012	678.5	749.7	130.25	5.97539	3768
	31/07/2012					
2012-08	01/08/2012	604.0	667.4	116.78	4.76906	3008
	31/08/2012					

Using Equation (4) in PDD, total Baseline Emissions in the part 2 (01/09/2011 to 31/08/2012) of the monitoring period =  $\sum BE_i = 35,441 \text{ tCO}_2\text{e}$

Using Equation (4) in PDD, total Baseline Emissions in the monitoring period is:  
 $29297 + 35441 = 64,738 \text{ tCO}_2\text{e}$

Therefore, the total Baseline Emissions generated in the monitoring period is **64,738 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 leakage.

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

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO <sub>2</sub> e)
<b>Total</b>	64,738	0	0	64,738

**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
Emission reductions or GHG removals by sinks (tCO <sub>2</sub> e)	65,544	64,738

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

Month	Time Interval	Monthly CERs in registered PDD (tCO <sub>2</sub> e)
2010-09	15/09/2010 – 30/09/2010	1621 <sup>1</sup>
2010-10	01/10/2010 – 31/10/2010	2899
2010-11	01/11/2010 – 30/11/2010	1911
2010-12	01/12/2010 – 31/12/2010	1878
2011-01	01/01/2011 – 31/01/2011	1988
2011-02	01/02/2011 – 28/02/2011	2309
2011-03	01/03/2011 – 31/03/2011	2723
2011-04	01/04/2011 – 30/04/2011	3035
2011-05	01/05/2011 – 31/05/2011	3446
2011-06	01/06/2011 – 30/06/2011	3688
2011-07	01/07/2011 – 31/07/2011	3473
2011-08	01/08/2011 – 31/08/2011	3091
2011-09	01/09/2011 – 30/09/2011	3041
2011-10	01/10/2011 – 31/10/2011	2899
2011-11	01/11/2011 – 30/11/2011	1911
2011-12	01/12/2011 – 31/12/2011	1878
2012-01	01/01/2012 – 31/01/2012	1988
2012-02	01/02/2012 – 29/02/2012	2309
2012-03	01/03/2012 – 31/03/2012	2723
2012-04	01/04/2012 – 30/04/2012	3035
2012-05	01/05/2012 – 31/05/2012	3446
2012-06	01/06/2012 – 30/06/2012	3688
2012-07	01/07/2012 – 31/07/2012	3473
2012-08	01/08/2012 – 31/08/2012	3091
<b>Total</b>		<b>65,544</b>

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

&gt;&gt;

The actual monitored emission reduction (ER) is 64,738 tCO<sub>2</sub>e, which is lower than the estimated 65,544 tCO<sub>2</sub>e in PDD. The lower actual ER is due to the fact that the starting date of operation of the project

<sup>1</sup> The ex-ante calculation for September in registered PDD is 3041 tCO<sub>2</sub>e, Sep 15~30 is 16 days. Thus, the ex-ante calculation for Sep 15~30 is 3041\*(16/30) = 1621



activity was 2 November 2010, which is later than the starting date of the monitoring period (15 September 2010). There was no ER generated from 15 September 2010 to 1 November 2010, so the actual ER value is lower than the estimated value in PDD. The difference between the actual value and estimated value is reasonable.

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