

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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SECTION A. General description of small-scale project activity
A.1 Title of the small-scale project activity:

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Federal Intertrade Pengyang Solar Cooker Project

Version of document: 15

Date of document: 3 March 2009

A.2. Description of the small-scale project activity:

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“Federal Intertrade Pengyang Solar Cooker Project” (the proposed project) is located on the dry land of southern Ningxia in northwestern China. Implemented by Ningxia Federal Intertrade Co., the proposed project will install 17,000 solar cookers for the poor rural residents in mountainous area with a rural population of 92,331 or 20,341 households¹. The project will cover 83.6% of the households in the project region. The rating power of each solar cooker is 773.5W and the total capacity of the proposed project is 13.1 MW. The proposed project will enable the rural residents to efficiently substitute solar energy for the fossil fuel (coal) used in daily cooking and water boiling, avoiding CO₂ emission that would be generated by fossil fuel consumption. It is estimated that 35,723 tCO₂e emission reductions will be produced annually.

The development of the proposed project is in line with the priority choice of Chinese energy sector, and it will facilitate the sustainable development of the project site as well as the host country in the following aspects:

- ♦ Providing rural residents with a clean, practical and convenient way to meet the energy demand of their daily cooking;
- ♦ Improving the indoor hygiene of rural residents;
- ♦ Improving the living condition and quality of rural residents;
- ♦ Mitigating GHG emission.

The mountainous area in southern Ningxia is one of the poorest regions in China. The area belongs to state-level poor area of China and the per capita annual income in this area is around Chinese Yuan (CNY) 1518² or 139 Euro³. The dry land of this region is experiencing severe desertification and the ecological environment there is extremely vulnerable⁴.

The rural Pengyang region is an ideal region for utilizing solar energy. Located at high altitude, this region has many sunny days. It is one of the most suitable regions in China for utilizing solar energy.

The proposed project will provide 17,000 solar cookers to the rural residents in this region. The project will be managed and financed by Ningxia Federal Intertrade Co.

¹ Based on the latest data from Bureau of Agriculture, Graze, and Science & Technology of Pengyang County, the governmental branch in charge of rural affairs.

² Almanac of Ningxia, 2005

³ 1 Euro = 10.9 CNY as of November 2007

⁴ The Encyclopaedia of Ningxia, Ningxia People's Publishing House, 1998

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The proposed project will significantly contribute to sustainable development of this region. It will serve as a model for future project and stimulate the interests of investors in solar energy projects. It will promote the use of clean energy, educate and train the rural population on solar energy technology, and build awareness in environmental protection among the rural population. Those who will be directly benefited from the proposed project are 17,000 low-income households or at least 68,000 villagers (average household has 4-5 people⁵). The poor rural residents will get clean and reliable energy supply for their daily cooking. The technology and experience gained from this project can be transferred to future projects. The experienced personnel trained by this project can assist other projects in the future.

A.3. Project participants:

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The participants of the proposed project include:

Table 1. Information of project participants

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Ningxia Federal Intertrade Co. (Project Owner)	No
Netherlands	SwissRe Global Markets Limited (CER Purchaser)	No

Detailed contact information on the Participants and other Parties are provided in Annex 1.

A.4. Technical description of the small-scale project activity:**A.4.1. Location of the small-scale project activity:**

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A.4.1.1. Host Party(ies):

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China

A.4.1.2. Region/State/Province etc.:

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Ningxia Hui Autonomous Region

A.4.1.3. City/Town/Community etc:

⁵ According to “The Family Planning Regulations of Ningxia Hui Autonomous Region”, in the rural area of Pengyang County, one couple can have 2 children. If the couple is minority, they can have 3 children. Moreover, some couples live together with their parent(s) to take care of them, This is why on average one household has 4-5 people.

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Seven townships (Luowa, Jiaocha, Wangwa, Xiaocha, Fengzhuang, Caomiao, and Mengyuan) in mountainous northern rural area of Pengyang County

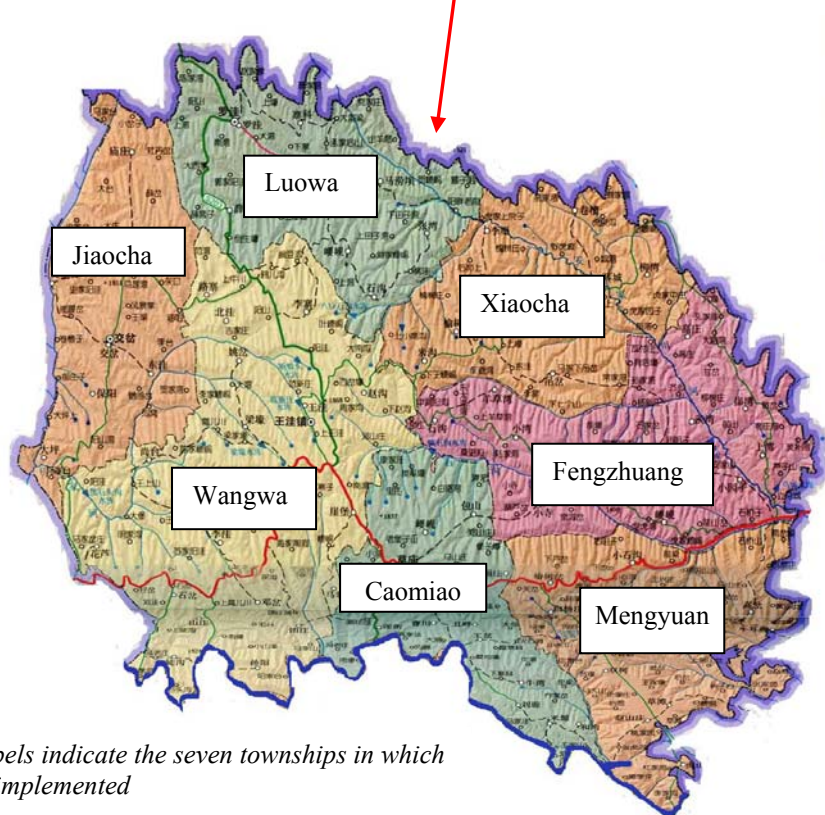
A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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The areas involved in the proposed project include seven townships (Luowa, Jiaocha, Wangwa, Xiaocha, Fengzhuang, Caomiao, and Mengyuan) in northern Pengyang County in Ningxia Hui Autonomous Region. The location is approximately within east longitude 106°30'-106°55' and north latitude 35°57'-36°16'. The total area of the project site is about 1365 km². The detailed location is illustrated in the 3 maps in Figure 1.

The first map indicates the relative location of Ningxia Hui Autonomous Region in China. The second map indicates the relative location of the project site inside Ningxia Hui Autonomous Region. The third map illustrates the detailed locations of the villages in which the project will be implemented.





Note: The white labels indicate the seven townships in which the project will be implemented

Figure1: Geographic Location of Federal InterTrade Pengyang Solar Cooker Project

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The detailed locations of the villages involved in the project are marked by the red flags in the map below:



The locations and areas of the 7 townships involved in the project

Township name	Area (km ²)	Location of township center
Wangwa	341.56	Latitude 36° 6'14"N
		Longitude 106°38'15"E
Fengzhuang	177.62	Latitude 36° 3'59"N
		Longitude 106°49'0"E
Xiaocha	151.59	Latitude 36° 8'59"N
		Longitude 106°46'0"E
Mengyuan	211.88	Latitude 35°58'1"N
		Longitude 106°49'1"E
Luowa	156.21	Latitude 36°16'0"N
		Longitude 106°34'0"E
Jiaocha	145.73	Latitude 36° 8'54"N
		Longitude 106°34'21"E
Caomiao	180.77	Latitude 36° 2'1"N
		Longitude 106°41'1"E

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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According to the Simplified modalities and procedures for small-scale clean development mechanism project activities (decision 4/CMP.1, Annex II) publicized by UNFCCC, the project type and category are defined as follows:

Type I: Renewable Energy Projects

Category I.C.: Thermal energy for the user with or without electricity (Version 12, EB 33)

The proposed project is to install 17,000 parabolic type solar thermal cookers for rural users in Ningxia Hui Autonomous Region in China, replacing coal used previously for cooking and water boiling. This will lead to a reduction of coal consumption and consequently a reduction of CO₂ emission. The rating power of each solar cooker is 773.5 Watt⁶. Therefore, the total size of the project is 13.1 MW (773.5×17,000×10⁻⁶), below the 45 MW limit of small-scale CDM project.

The parameters of the solar cookers engaged in the proposed project are listed below:

⁶ 773.5 watts is calculated based on Chinese National Standard (GB), GB No.: NY/T219-2003

as below:

$$R = 700 \text{ w/m}^2, A = 1.7\text{m}^2, \eta = 65\% \text{ (For the justification of the values of } R, A, \text{ and } \eta, \text{ refer to section B6.2)}$$

$$\text{Rating power} = R \cdot A \cdot \eta = 773.5 \text{ w.}$$

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Item	Value	Justifications
Focus (mm)	600 ~ 750	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Aperture (Light Collecting) Area (m ²)	1.7	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Rating Power (W)	773.5	National Standard of P.R. China (GB), GB No.: NY/T219-2003, calculation based on the footnote below
Thermal Efficiency (%)	At least 65%	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Temperature in the focus area (°C) and the size of focus area (cm ²)	The area with temperature beyond 400°C is between 50cm ² and 200cm ²	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Maximum operational height (m)	1.25	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Maximum operational distance (m)	0.8	National Standard of P.R. China (GB), GB No.: NY/T219-2003
Weight (kg)	60	Required by the project owner

The above choice of solar cookers parameters is based on National Standard of P.R. China (GB) for solar cookers (GB No.: NY/T219-2003).

All the equipments engaged in the proposed project are domestic, and no technology transfer is involved.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Fixed crediting period is selected for the project activity (1 February 2009 – 31 January 2019)	
Years	Annual estimation of emission reductions in tonnes of CO ₂ e
1 Feb. 2009 – 31 Jan. 2010	35,723
1 Feb. 2010 – 31 Jan. 2011	35,723
1 Feb. 2011 – 31 Jan. 2012	35,723

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1 Feb. 2012 – 31 Jan. 2013	35,723
1 Feb. 2013 – 31 Jan. 2014	35,723
1 Feb. 2014 – 31 Jan. 2015	35,723
1 Feb. 2015 – 31 Jan. 2016	35,723
1 Feb. 2016 – 31 Jan. 2017	35,723
1 Feb. 2017 – 31 Jan. 2018	35,723
1 Feb. 2018 – 31 Jan. 2019	35,723
Total estimated reductions (tCO₂e)	357,230
Number of the crediting years	10
Annual average over the crediting period of estimated reductions (tCO₂e)	35,723

A.4.4. Public funding of the small-scale project activity:

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There is no official funding involved in the proposed project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project will not install any solar cooker within the 1-km belt zone to the north of the southern border of the project region shown in Figure 1. And there is not a registered small-scale CDM project activity or an application to register another small-scale CDM project activity whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

Therefore, the proposed project activity is not a debundled component of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology**B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

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The methodology applied for this project is the approved small-scale CDM baseline methodology “AMS-I.C (Version 12, EB33), Thermal energy for the user with or without electricity”. For more information regarding the methodology, please refer to the link:

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

B.2 Justification of the choice of the project category:

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The methodology AMS-I.C is applicable to this small scale CDM project activity because:

- The proposed project supplies individual households or users with solar cookers that allow the user to use solar energy to displace coal used for cooking and water-boiling.
- The installation capacity of the proposed project is 13.1 MW, which is within the limit of 45 MW stipulated for the chosen (small-scale) methodology.

B.3. Description of the project boundary:

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The physical and geographic boundary of the proposed project includes seven townships (Luowa, Jiaocha, Wangwa, Xiaocha, Fengzhuang, Caomiao, and Mengyuan) in mountainous region of northern Pengyang County in Ningxia Hui Autonomous Region, China.

Table 2. Description of emission sources and GHG categories of the proposed project

	Source of Emission	Gas	Included/Excluded	Instruction
Baseline	Coal-fired cooking and water-boiling	CO ₂	Included	Main emission source
		CH ₄	Excluded	Excluded for simplicity; being conservative
		N ₂ O	Excluded	Excluded for simplicity; being conservative
Project Activities	Project Activity Emission	CH ₄	Excluded	There is no CH ₄ emission
		CO ₂	Excluded	There is no CO ₂ emission
		N ₂ O	Excluded	There is no N ₂ O emission

B.4. Description of baseline and its development:

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According to small-scale CDM baseline methodology AMS-I.C (Version 12, EB33), Thermal energy for the user with or without electricity, “For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced.”

In the absence of the proposed project, the rural residents would continue to use the coal-fired stoves for their daily cooking and water-boiling as usual. According to a recent official document from local government⁷ and China Energy Statistical Yearbook (2006), all the rural residents in the project site use coal for their daily cooking and water-boiling. The document from local government also confirms that in the project site 1) cutting wood and vegetation is illegal so that the rural residents there do not use firewood for cooking and water-boiling, 2) electricity is only used for lighting, not for cooking and water-boiling, 3) the availability of straw is limited and all the straw there are used for feeding animals, and 4) the dominant activity is agriculture and all the animal wastes are used for fertilizers in the fields. Therefore, the baseline scenario of the proposed project is that the 17,000 households continue to cook and boil water with coal-fired stoves. The simplified baseline is the coal consumption of the existing stoves times the emission coefficient of coal.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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⁷ *Explanation on the population and rural fuel usage of Pengyang County*, April 2008, by Bureau of Agriculture, Graze and Science & Technology of Pengyang County, the governmental branch in charge of rural affairs in Pengyang County

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According to Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities (version 06), compared with the baseline scenario, the proposed project faces obvious barrier.

Investment Barrier

If the proposed project were carried out without CDM, the total upfront project investment by the project owner would be about Chinese Yuan (CNY) 5.68 million and after such investment the project would not generate any revenue to the project owner throughout the entire project life. The projected financial statement of the proposed project without CDM is as below (Note: positive and negative monetary values mean cash flowing in and out, respectively):

Parameters (without CDM):

Project Lifetime ⁸ :	10	Years
Equipment ⁹ :	-510	$\times 10^4$ CNY
Project Development Cost ¹⁰	-16	$\times 10^4$ CNY
Implementation Cost ¹¹	-51	$\times 10^4$ CNY
Contribution from the user ¹²	51	$\times 10^4$ CNY
Subtotal Investment	-526	$\times 10^4$ CNY
Contingency (8% of investment)	-42	$\times 10^4$ CNY
Total Upfront Investment:	-568	$\times 10^4$ CNY
Annual maintenance cost ¹³ :	-36	$\times 10^4$ CNY
Annual Inflation Rate ¹⁴ :	6%	
Income Tax Rate ¹⁵ :	25%	

⁸ The confirmation letters from solar cooker vendors confirmed that the cookers can be used for at least 10 years.

⁹ According to the confirmation letters from solar cooker vendors, the upfront equipment cost includes transportation, installation and maintenance for the first 3 years.

¹⁰ Includes feasibility study, coordinating with government and equipment vendors, develop project documents, managing cooker manufacturing and distribution, and user training, etc.

¹¹ The compensation paid to external service on the implementation of the project.

¹² The contribution from the solar cooker user (to cover the implementation cost), 30 CNY for each cooker.

¹³ According to the confirmation letters from solar cooker vendors, for the first 3 years the annual maintenance cost is 20 CNY per cooker. Then we assume that starting from the 4th year, the maintenance cost is adjusted by annual inflation rate of 6%. Therefore, for the 4th year, the annual maintenance cost = $17000 \times 20 \times (1+6\%) = 36 \times 10^4$ CNY. From the 5th year to the 10th year, each year the maintenance cost is increased by 6% based on the maintenance cost of the previous year.

¹⁴ The 6% annual inflation rate reflects the recent inflation rate of China. This estimation is based on the recent inflation rate in China (8.7% in February 2008 according to New York Times). Since the maintenance cost of the first 3 years are already included in the upfront equipment cost, the maintenance costs are inflation-adjusted annually during 4th to 10th year of the project;

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Net Present Value of Project¹⁶: -812 ×10⁴ CNY

As shown above, the Net Present Value (NPV) of the proposed project without CDM is -8.12 million CNY. In fact, because without CDM the project does not generate any revenue, no matter how the variables (investment cost, maintenance cost, discount rate, etc.) vary, the NPV will always be negative. It is obvious that without CDM revenue the proposed project is not financially attractive at all. Therefore, the project faces obvious investment barrier.

In contrast, if the project is implemented as a CDM project, the CER revenue will make the project become financially attractive as shown below (Note: the meanings of the terms in this section are the same as those in “without CDM” section unless explained otherwise):

Parameters (with CDM):

Project Lifetime:	10	Years
CDM Crediting period:	10	Years
Equipment:	-510	×10 ⁴ CNY
CDM Project Development Cost ¹⁷ :	-159	×10 ⁴ CNY
Implementation Cost	-51	×10 ⁴ CNY
Contribution from the user	51	×10 ⁴ CNY
Subtotal Investment	-669	×10 ⁴ CNY
Contingency (8% of investment)	-54	×10 ⁴ CNY
Total Upfront Investment:	-723	×10 ⁴ CNY
Annual maintenance cost:	-36	×10 ⁴ CNY
Annual Inflation Rate ¹⁸ :	6%	
Income Tax Rate:	25%	
Expected CER Price:	8.65	EUR
Project IRR:	16.0%	

¹⁵ The standard corporate income tax rate in China is 25%.

¹⁶ The discount rate used to calculate the NPV is 5.85%. This is based on the recent Chinese Yuan (CNY) deposit rate (December 2007) for 60 month is 5.85%. The source is the website of Bank of China: <http://www.boc.cn/en/common/rmbdeposit.jsp?category=1099376639100>

¹⁷ Includes CDM consulting/commission cost, PDD development, DOE validation, and EB registration fees.

¹⁸ The 6% annual inflation rate reflects the recent inflation rate of China. This estimation is based on the recent inflation rate in China (8.7% in February 2008 according to New York Times). Since the maintenance cost of the first 3 years are already included in the upfront equipment cost, the maintenance costs are inflation-adjusted annually during 4th to 10th year of the project. The monitoring costs and DOE verification cost are inflation-adjusted annually during the entire project life of 10 years;

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The project will be implemented in the dry land experiencing severe desertification¹⁹. As a result, in the project region there is very limited amount of vegetation available. Coal is abundant in the region²⁰. As explained in section B.4, the common and dominant practice in the project region is using coal for cooking and water-boiling. Such common practice has been confirmed²¹ by the Bureau of Agriculture, Graze and Science & Technology of Pengyang County (BAGSTPC), the governmental branch in charge of rural affairs. According to the confirmation from BAGSTPC, all the rural residents within the project boundary use coal for their daily cooking and water-boiling purpose. Hence, the proposed project is obviously additional compared to such common practice.

If the project can be successfully registered as a CDM project, then the CDM revenue will provide the only financial incentive to the project developers, transforming an otherwise financially unattractive project into an attractive one. As a matter of fact, the proposed project will not be started until it is successfully registered with EB. Therefore, CDM revenue is absolutely crucial to the successful implementation of this project. The successful registration of the project will serve as a model for future project and stimulate the interests of investors in similar projects.

Moreover, the successful registration of the proposed project will promote the use of clean energy in rural areas, educate and train the rural population on solar energy technology, and build awareness in environmental protection among the rural population.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:
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The emission reduction ER_y during a given year y is calculated as follow:

$$ER_y = BE_y - PE_y - L_y \quad (1)$$

Where:

ER_y the emission reductions produced by the proposed project.

BE_y the baseline emissions from heat displaced by the project activity during the year y in tCO₂e.

PE_y the emissions produced by the proposed project.

L_y the leakage produced by the proposed project.

¹⁹ The Encyclopaedia of Ningxia, Ningxia People's Publishing House, 1998

²⁰ According to the website of National Development and Reforming Commission (NDRC) of China, (http://www.sdpc.gov.cn/dffgwdt/t20060607_72051.htm), Ningxia has plenty of coal reserves. The proven coal reserve is 31.56 billion tonnes. The per capita coal reserve ranks the first in China.

²¹ *Explanation on the population and rural fuel usage of Pengyang County*, April 2008, by Bureau of Agriculture, Graze and Science & Technology of Pengyang County, the governmental branch in charge of rural affairs in Pengyang County.

Step 1: Estimate the Emission of All Kinds of Greenhouse Gas in the Project activity (PE_y)

The implementation of the proposed project will not produce any GHG emission, i.e. $PE_y=0$.

Step 2: Estimate the Leakage

The solar cookers to be used in the proposed project will be directly purchased from the manufacturers. The project participants will not transfer the solar cookers out of the proposed project activity during the entire project life. The project implementation and monitoring plan will ensure that 1) only the households that currently do not have solar cooker will receive the new solar cookers, and 2) if the recipient no longer wants to use the cooker, he/she must immediately return the cooker back to the project owner, and the project owner will immediately give this returned cooker to someone else who does not have a cooker. Therefore, according to AMS-I.C., the energy generating equipment (solar cookers) is neither transferred from another activity, nor is it transferred to another activity. As a result, it is not necessary to consider the leakage in the proposed project, i.e. $L_y = 0$.

Step 3: Estimate the Baseline Emission (BE_y)

According to AMS-I.C., the baseline emission of the proposed project (BE_y) could be calculated by the following formula:

$$BE_y = HG_y * EF_{CO_2} / \eta_{th} \quad (2)$$

Where:

BE_y the baseline emissions from heat (generated by burning coal) displaced by the project activity during year y in tCO₂e.

HG_y the net quantity of heat supplied by the project activity during the year y in TJ.

EF_{CO_2} the CO₂ emission factor of coal (tCO₂e/ TJ).

η_{th} the efficiency of the coal-fired stove that would have been used in the absence of project activity

The annual net quantity of heat supplied by the project, HG_y , is the sum of 12 monthly net heat supplied, and consequently the annual baseline emission of the project, BE_y , is the sum of 12 monthly baseline emission.

$$HG_y = \sum HG_i \quad (i=1,2, \dots, 12) \quad (3)$$

$$BE_y = \sum BE_i \quad (i=1,2, \dots, 12) \quad (4)$$

$$BE_i = HG_i * EF_{CO_2} / \eta_{th} \quad (i=1,2, \dots, 12) \quad (5)$$

where HG_i is the net heat supplied in month i in TJ

BE_i is the baseline emission in month i in tCO₂e

According to basic physics principle,

$$\text{Heat} = \text{Power} * \text{Time}$$

The monthly net heat supplied by the cooker is the product of its actual power in that month and its usage time in that month, i.e.:

$$HG_i = n * [P_i * t_i * (3.6 \times 10^{-9})] \quad (6)$$

Where n is the total number of solar cookers installed by the proposed project. The value adopted is 17,000;

P_i is the actual average power of the solar cooker in month i in W

t_i is the usage time of each solar cooker in month i in hours. The value adopted is 120 (4 hours per day for 30 days, see section B7.1 parameter #2 for details)

3.6×10^{-9} is the conversion factor between “W*h” and “TJ”, i.e., 1 W*h = 3.6×10^{-9} TJ (Note: 1h = 3600s, 1 W*h = 3600 W*s = 3600 J = 3.6×10^{-9} TJ)

Combine (5) and (6), we get

$$BE_i = n * [P_i * t_i * (3.6 \times 10^{-9})] * EF_{CO_2} / \eta_{th} \quad (i=1,2, \dots, 12) \quad (7)$$

The actual power of the solar cooker P_i is proportional to the solar irradiance rate under which the cooker is operated. The rating power 773.5W is calculated under the “standard solar irradiance rate” of 700 W/m² according to Chinese national standard. Therefore, the actual power of the cooker is its rating power times the ratio of actual solar irradiance rate and 700 W/m²:

$$P_i = 773.5 * (R_i / 700) \quad (8)$$

Where R_i is the actual solar irradiance rate in month i in W/ m². The values adopted are in section B6.2 parameter #3;

Substitute (8) in (7), then substitute (7) in (4), we have

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

Where:

R_i R_i is the actual solar irradiance rate in month i in W/ m². The values adopted are in section B6.2 parameter #3;

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t_i	t_i is the usage time of the solar cooker in month i in hours. The value adopted is 120 (4 hours per day for 30 days, refer to section B7.1 parameter #2 for details)
n	The total number of solar cookers installed by the proposed project. The value adopted is 17,000.
EF_{CO_2}	the CO_2 emission factor of coal (tCO_2e/TJ). IPCC default emission factor of $94.6tCO_2e/TJ$ will be adopted in the proposed project.
η_{th}	the efficiency of the coal-fired stove that would have been used in the absence of project activity. The value adopted is 15% (refer to section B6.2 parameter #6 for details).

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	1.EF CO_2
Data unit:	tCO_2/TJ
Description:	Baseline emission factor
Source of data used:	IPCC2006, page 2.22, Table2.5
Value applied:	94.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	Adopt IPCC default value
Any comment:	

Data / Parameter:	2.R
Data unit:	W/m^2
Description:	Standard solar irradiance rate used to calculate rating power of solar cooker
Source of data used:	National Standard of the People's Republic of China, GB No.: NY/T219-2003
Value applied:	700
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to National Standard of P.R. China (GB), GB No.: NY/T219-2003, for calculating the rating power of solar cookers, $700 W/m^2$ should be used for as the standard value of solar irradiance rate.
Any comment:	

Data / Parameter:	3. R_i
Data unit:	W/m^2
Description:	Monthly solar irradiance rate in project region
Source of data used:	Ningxia Meteorological Archives
Value applied:	Month Value (Also refer to Annex 3 for details)

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	1	397.6
	2	519.6
	3	521.8
	4	601.6
	5	689.5
	6	746.1
	7	666.1
	8	727.7
	9	656.7
	10	652.2
	11	402.6
	12	398.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Ningxia Meteorological Archives is the official source for Ningxia meteorological data.	
Any comment:		

Data / Parameter:	4.A
Data unit:	m ²
Description:	Solar cooker's light-collecting area
Source of data used:	Project owner
Value applied:	1.7
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the technical specification of the solar cooker
Any comment:	

Data / Parameter:	5. η
Data unit:	
Description:	Solar cooker's thermal efficiency
Source of data used:	Solar cooker testing report from Ningxia Department of Agriculture and Graze, Rural Energy Section
Value applied:	65%
Justification of the choice of data or description of measurement methods and procedures actually applied :	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 65%.
Any comment:	

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Data / Parameter:	6. η_{th}
Data unit:	
Description:	Thermal efficiency for the traditional coal furnace
Source of data used:	1) “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 http://www.undp.org/energy/publications/2002/2002b.htm 2) 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.
Value applied:	15%
Justification of the choice of data or description of measurement methods and procedures actually applied :	For reference #1: Paragraph 2 in page 8: The most common method of cooking throughout rural areas of the developing world is the open hearth or three-stone fire, which typically transfers only 5-15 per cent of the fuel's energy into the cooking pot. Following conservative principle, the value of 15% shall be taken because it will lead to the least emission reduction. For reference #2: According to paragraph 13 of methodology AMS-I.C.(version 12), the efficiency of the baseline units shall be determined by adopting one of the following criteria: (a) Highest measured efficiency of a unit with similar specifications, (b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, (c) Maximum efficiency of 100%. As the provincial authority in charge of collecting and monitoring energy usage data in Ningxia, Energy Saving Monitoring Technical Service Center of Ningxia Hui Autonomous Region (“ESMTS of Ningxia”) conducted a measurement of efficiency for rural coal stove in Ningxia from May 2007 to October 2007. During this period, ESMTS of Ningxia measured the thermal efficiencies of 100 coal stoves at rural residents’ home across 7 counties (including Pengyang county where our project is located) in Ningxia. The 7 counties are located closely together with very similar climate condition, living condition, and living habits. Therefore, the coal stoves measured by ESMTS of Ningxia are very similar to those involved in the proposed Project. The method of the measurement was Chinese National Standard “<i>Method for testing household coal and stoves</i>” (GB 6412-86). The measurement results are: the highest efficiency is 15.0%, the lowest efficiency is 9.6%, and the average is 12.3%. The highest measured efficiency value (15%) was confirmed by ESMTS of Ningxia in its official letter titled “<i>Explanation on rural stoves in Ningxia</i>”(dated 2 April 2008) and later elaborated in another official letter titled

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	“The explanation on the thermal efficiency measurement data of domestically-used rural coal-stove in southern mountainous region of Ningxia” (Dated 27 February 2009). With the above measurement data, according to option (a) of paragraph 13 of methodology AMS-I.C.(version 12), 15% shall be chosen as the baseline thermal efficiency for the coal stoves.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

According to B.6.1, the emission reduction (ER_y) of the project activity in a given year y is the difference between the baseline emission and the sum of project emission (PE_y) and emission from leakage (L_y). The calculation formula is as following:

$$ER_y = BE_y - PE_y - L_y$$

Since both of the project emission and leakage within the boundary are zero, the emission reduction of the proposed project is equal to the baseline emission, i.e.:

$$ER_y = BE_y$$

where BE_y is the CO₂ emission from the continued usage of coal-fired stoves in the absence of the proposed activity and its value is equal to the emission reduction.

According to the formulas (3), (5), (6), and (8) in B6.1, the calculation result is tabulated as below:

	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)	t_i	HG_i $= n \cdot [P_i \cdot t_i \cdot (3.6 \times 10^{-9})]$ Equation (6)	BE_i $= HG_i \cdot EF_{CO_2} / \eta_{th}$ Equation (5)
Month	(W/m ²)	(W)	(hour)	(TJ)	(tCO ₂ e)
1	397.6	439.4	120	3.22682	2035
2	519.6	574.1	120	4.21640	2659
3	521.8	576.6	120	4.23419	2670
4	601.6	664.8	120	4.88201	3079
5	689.5	761.9	120	5.59553	3529
6	746.1	824.4	120	6.05460	3818
7	666.1	736.1	120	5.40580	3409

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8	727.7	804.1	120	5.90546	3724
9	656.7	725.7	120	5.32942	3361
10	652.2	720.7	120	5.29305	3338
11	402.6	444.9	120	3.26711	2060
12	398.5	440.3	120	3.23348	2039

Using Equation (4), total annual CER = $BE_y = \sum BE_i = 35723$

Therefore, the annual emission reduction (ER_y) of the proposed project is estimated to be 35,723 tCO₂e, i.e.,

$$ER_y = BE_y = 2035 + 2659 + 2670 + 3079 + 3529 + 3818 + 3409 + 3724 + 3361 + 3338 + 2060 + 2039 = 35,723 \text{ tCO}_2\text{e}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

The net emission reduction induced by the proposed project activity in the 10-year crediting period (1 February 2009 – 31 January 2019) is estimated to be 357,230 tCO₂e.

Year	Estimation of baseline emissions (tCO ₂ e)	Estimation of the project activity emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of emission reductions (tCO ₂ e)
1 Feb. 2009 – 31 Jan. 2010	28,359	0	0	35,723
1 Feb. 2010 – 31 Jan. 2011	35,723	0	0	35,723
1 Feb. 2011 – 31 Jan. 2012	35,723	0	0	35,723
1 Feb. 2012 – 31 Jan. 2013	35,723	0	0	35,723
1 Feb. 2013 – 31 Jan. 2014	35,723	0	0	35,723
1 Feb. 2014 – 31 Jan. 2015	35,723	0	0	35,723
1 Feb. 2015 – 31 Jan. 2016	35,723	0	0	35,723
1 Feb. 2016 – 31 Jan. 2017	35,723	0	0	35,723
1 Feb. 2017 – 31 Jan. 2018	35,723	0	0	35,723
1 Feb. 2018 – 31 Jan. 2019	35,723	0	0	35,723
Total emission reductions (tCO ₂ e)	357,230	0	0	357,230

B.7 Application of a monitoring methodology and description of the monitoring plan:
B.7.1 Data and parameters monitored:

Data / Parameter:	1. <i>n</i>
Data unit:	
Description:	Number of solar cookers engaged in the proposed project

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Source of data to be used:	Sales contract and invoice of the solar cookers. Annual monitoring result
Value of data applied for the purpose of calculating expected emission reductions in section B.5	17,000
Description of measurement methods and procedures to be applied:	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. The details of monitoring of this parameter is in section B7.2, “Description of the monitoring plan”
QA/QC procedures to be applied:	Refer to B.7.2
Any comment:	Record will be kept in electronic form and paper form.

Data / Parameter:	2. t_i
Data unit:	Hour
Description:	The monthly operating time of each solar cooker
Source of data to be used:	To be determined by the result of the sampling survey
Value of data applied for the purpose of calculating expected emission reductions in section B.5	120 ²²
Description of measurement methods and procedures to be applied:	The monitoring will be conducted daily on the selected sample users determined at the beginning of each year. The data will be summarized, analyzed, and archived monthly by the CDM Department of Ningxia Federal Intertrade Co.
QA/QC procedures to be applied:	Refer to B.7.2
Any comment:	Record will be kept in electronic form and paper form.

B.7.2 Description of the monitoring plan:

>>

The objective of the monitoring plan is to ensure the successful monitoring of the emission reduction of the proposed project during the crediting period.

The project implementation is scheduled to take place in 2008. The implementation will start with the tender bidding process of the solar cookers in January 2008. Several solar cooker manufacturers will be selected for the project. In February 2008 the selected solar cooker vender will start delivering solar cookers to the users from their inventory and start making the remaining cookers required for the project.

²² According to the *Explanation on Solar Cooker Usage Time and Cooking Habits in Pengyang County* (by Bureau of Agriculture, Graze and Science & Technology of Pengyang County, April 2008), to meet the daily cooking and water-boiling need of a rural family using solar cooker, the daily usage time of the solar cooker is at least 4 hours. Therefore the monthly usage is: $4 \times 30 = 120$ hours.

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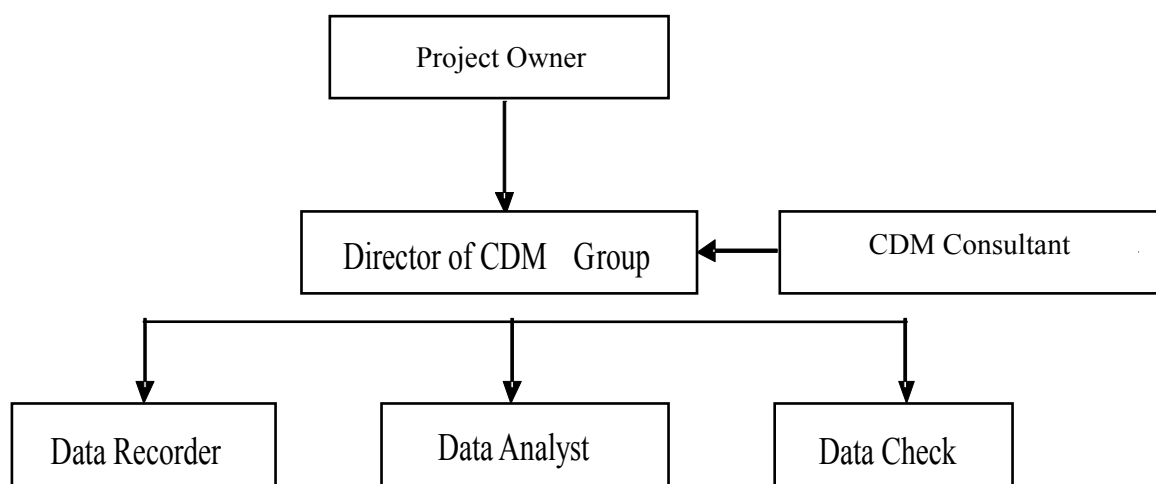
From February through March 2008, the solar cookers will be delivered to the users as soon as they are produced by the manufacturer. It is estimated by later March or early April 2008, all the solar cookers required by the project will be delivered to the users for them to use. Please note that the above plan was the original plan which was determined during project design phase in 2007. The actual implementation plan will depend on the registration date of the proposed project.

The project implementation and monitoring plan will ensure that 1) only the households that currently do not have solar cooker will receive the new solar cookers, and 2) if the recipient no longer wants to use the cooker, he/she must immediately return the cooker back to the project owner, and the project owner will immediately give this returned cooker to someone else who does not have a cooker.

1. Monitoring Organization

The overall monitoring of the project will be managed by the project owner, Ningxia Federal Intertrade Co. The Rural Energy Section under the Bureau of Agriculture, Graze, and Science & Technology of Pengyang County (Hereinafter “RES”) will implement the monitoring under the supervision of the project owner. RES will establish CDM groups for the villages to be monitored²³ within the project boundary to collect and record monitoring data. The CDM groups will be recruited locally, managed by RES and supervised by the project owner. The candidates will be carefully screened to ensure that each CDM group member has the proper ability to perform the monitoring task. Each CDM group will consist of 1~5 people and each person will be in charge of the monitoring of 5~20 users. The group directors will be trained and supported by the CDM department of the project owner and experienced CDM consultants. The project owner will work closely with RES to ensure proper equipment installation, training of the users, monitoring, document preservation, and maintenance.

The organization of the project monitoring is as the following:



2. Data Monitored

²³ The choice of villages to be monitored is determined in B7.2, Section 3 “Monitoring Method”.

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According to paragraph 17 of AMS-I.C., if the emissions reduction per system is less than 5 tonnes of CO₂ a year:

(a) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute); and

(b) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available.

In the proposed activity, the emission reduction from each solar cooker is $35723/17000 = 2.1 < 5$ tCO₂e. Therefore, what need to be monitored are the number of solar cookers in operation and the average operating time of each solar cooker.

3. Monitoring Method

For the number of systems operating, a CDM group will be set up to track the number of operating solar cookers. The monitoring of total number of operating solar cookers will be conducted annually during the last quarter of each year. The following table will be used for monitoring and recording this parameter.

Solar Cooker No.	User Name	If this solar cooker exists and is operational, check “√”	Date of Checking	Checked by	Note
1					
2					
.....					
16,999					
17,000					
Summary	Number of operational solar cookers		Summarized by:		
	Number of non-operational solar cookers				

For the annual hours of operation of the solar cookers, sampling survey will be utilized in the monitoring.

(a) The population of the sampling survey is the 17,000 solar cookers to be installed by the proposed project;

(b) The project will be implemented in the seven townships concentrating in northern Pengyang country. The situations of these seven townships are very similar to each other. Therefore, random

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selection of the samples within the project boundary can be used. According to statistical principles, 309 samples²⁴ should be sufficient to represent the entire population of 17,000. Hence, about 309 sample users will be randomly selected from the seven townships within the project boundary.

A new set of 309 samples will be randomly selected at the beginning of each year during the crediting period.

(c) 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. At least once a month the monitoring form will be collected from each CDM group and the quality of data will be checked. Then statistical analysis will be done and average value will be calculated based on these data. 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. Then the data obtained can be used to check against other monitoring reports. In addition to above, the project owner will check the work of the CDM groups regularly to ensure the quality of monitoring. The format of the monitoring form to record the daily operating time of solar cooker is as below:

Year:	Month:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
The Actual Operating Time (h)																																	

²⁴ The required sampling quantity is calculated by the following steps: $n_1 = z^2 P(1-P)/e^2$, $n_2 = n_1 N / (N + n_1)$, $n_3 = B n_2$, $n_4 = n_3 / r$, $n = n_4 (110\%)$, where z equals to 1.645, corresponding to 95% confidence level. In statistics, 95% is a widely accepted and the most commonly used confidence level, which can be verified by Engineering Statistics Handbook of National Institute of Standard and Technology (NIST), an agency of the U.S. Commerce Department's Technology Administration. Here is the link of the source: <http://www.itl.nist.gov/div898/handbook/eda/section3/eda352.htm>;

P is the accuracy of the survey result and the P value taken is 0.5 to produce the largest standard deviation $P(1-P)$; e is the allowed sampling error and the e value taken is 5%; N is the total number of solar cookers 17,000; B is the survey design effect and in this case random sampling will be used so that the B value taken is 1; r is the survey reply rate and its value taken is 95%; and n_1 , n_2 , n_3 , n_4 , and n are the adjusted values after each step with n being the final number of samples to be taken. n_4 is actually the required number of samples based on calculation, 10% contingency was added to n_4 to produce n . The calculation result for n is 309.

[illegible]

To track the solar cookers, a serial number will be put on each of the solar cookers distributed to the users. A list of all the users and the corresponding serial numbers of their solar cookers will be kept. Then during the monitoring of total number of operating solar cookers, the monitoring team will also check if the serial number of each solar cooker matches its user according to the abovementioned list. This way, it can be ensured that no solar cooker will be transferred without being tracked.

Every month the CDM Department of Ningxia Federal Intertrade Co., the project owner, will summarize the data on monitoring forms collected from the CDM groups, check the data to make sure that the data are legible, uniform in format, complete, and effective, and then calculate the total monthly operating time for each solar cooker sampled. At the end of each year the annual total operating time will be calculated.

The data checker will check the raw data against the actual meteorological information obtained from local meteorological bureau. If the recorded raw data on the monitoring form are reasonable and basically consistent with the actual meteorological information, the raw data will be archived.

5. Maintenance

6. QA/QC Procedures

If the monitoring form is filled incorrectly, or the data record is wrong or damaged, the following makeup process will be conducted:

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1. If this is due to the working error of the CDM group personnel, further train the personnel until he or she can perform the job properly. And in the mean time, estimate the missing data from adjacent records;
2. If this is due to the inability or attitude of a particular worker in CDM group, dismiss such worker and re-hire those with proper ability and attitude. And in the mean time, estimate the missing data from adjacent records;
3. If a CDM group 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 RES create new CDM group according to the requirement of Ningxia Federal Intertrade Co.
4. If the data reported by the user significantly deviates from the normal range, the monitoring personnel should ask for the reason and record such reason on the monitoring form.

If the monitoring results are satisfactory in terms of correct reporting, data completeness and correct analysis, the data will be accepted for the monitoring report.

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

>>

The study of the baseline and the monitoring methodology was completed in July 20, 2007.

The key individuals involved in the baseline study are:

1. Ju Ning

Clean Air Trade, Inc.
43670 Lucketts Bridge Circle
Ashburn, VA 20148, USA
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Tel: +1-703-598-8032

The above individual or organizations is not a project participant.

2. Wei Jiang

Ningxia Federal Intertrade Co.
No.34, Chuang-xin Garden, High Technology Zone
Yinchuan, Ningxia, China. Post code: 750002
Tel: +86-951-5070212

The above organization is a project participant.

SECTION C. Duration of the <u>project activity</u> / <u>crediting period</u>

C.1 Duration of the <u>project activity</u>:

C.1.1. <u>Starting date of the project activity</u>:

>>

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November 2, 2007 (The term sheet was signed with CER buyer on this date, which marks the starting date of the project)

C.1.2. Expected operational lifetime of the project activity:

>>

10 years

C.2 Choice of the crediting period and related information:
C.2.1. Renewable crediting period
C.2.1.1. Starting date of the first crediting period:

>>

Not applicable

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:
C.2.2.1. Starting date:

>>

1 February 2009

C.2.2.2. Length:

>>

10 years

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

The project has completed the “The registration form for the environmental impact on construction projects” with the local environmental authority. The project has obtained the approval from the environmental authority.

It is a characteristic of such projects that there are no emissions or wastes. The solar cookers have a long lifetime, and all parts are totally recyclable.

Solar cooking has a high potential for reducing GHG emission and smoke by using clean energy and avoiding burning coal. CDM makes solar cooking accessible to poor people who particularly suffer from the environmental deterioration caused by GHG emission.

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The environmental impacts of the project may be summarized as follow:

- ◆ Prevention of resource depletion caused by consumption of coal;
- ◆ Avoidance of indoor air pollution from smoke of traditional stove;
- ◆ Diminishing GHG emission;
- ◆ Diminishing risks of fires caused by coal-fired stoves.

One of the main positive environmental impacts of the project will be the rising awareness among rural populations about environmental challenges, enabled by the sustainable technology and by the accompanying educational program.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

According to the opinion of the local environmental authority, the project has positive environmental impacts and it has no negative environmental impact.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

In July 2007, Mr. Wei Jiang, General Manager of Ningxia Federal Intertrade Co., the owner of the proposed project, visited the Rural Energy Section under the Bureau of Agriculture, Graze, and Science & Technology of Pengyang County (Thereinafter "RES"), the local government branch in charge of the rural energy sector. Mr. Jiang proposed the project to RES and the initial feedback was very positive. In the subsequent meetings with RES, the feasibility and implementing plan of the proposed project was discussed in detail.

Later Ningxia Federal Intertrade Co. conducted two surveys (one in September 2007 and the other in March 2008) on the rural residents in places where the project was planned to carry out. The surveys were done by randomly visiting the villagers as well as assembling the villagers and interviewing them. Totally 85 survey forms (corresponding to 80% confidence level according to the statistical method used in B7.2) were distributed and collected. The comments of local stakeholders in the form of the result of questionnaires are summarized in the following paragraphs and will be available to DOE.

The questionnaire included the following contents:

1. Brief introduction of the proposed project;
2. The survey invites the rural residents to participate;
3. Basic information and education level of the person surveyed

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4. Survey questions:

- 1) Do you know about the Project? (Know a lot; Know some; Never heard of it)
- 2) Which effect will be brought on your life by the proposed project (multiple choices allowed):
(Save energy; inconvenient to use; Reduce expenses; Enhance the living condition; inconvenient to repair; Other)
- 3) What do you think of the overall impacts of the proposed project? (Positives far outweigh negatives; Basically no impact; Negatives far outweigh positives)
- 4) Do you support the implementation of the proposed project? (support; against; neutral)
- 5) Are you willing to pay only 30 Yuan management fee, and then get the solar cooker for free? (Yes; No)
- 6) Any other comments or suggestions on the proposed project?

5. Signature and date

E.2. Summary of the comments received:

>>

The survey results are:

- 1) Do you know about the Project?
(Know a lot: 20%; Know some: 80%; Never heard of it: 0%)
- 2) Which effect will be brought on your life by the proposed project (multiple choices allowed)?
(Save energy: 61; inconvenient to use: 0; Reduce expenses: 76; Enhance the living condition: 27; inconvenient to repair: 0; Other: 0)
- 3) What do you think of the overall impacts of the proposed project?
(Positives far outweigh negatives: 100%; Basically no impact: 0%; Negatives far outweigh positives: 0%)
- 4) Do you support the implementation of the proposed project?
(support: 100%; against: 0%; neutral: 0%)
- 5) Are you willing to pay only 30 Yuan management fee, and then get the solar cooker for free?
(Yes: 100%; No: 0%)
- 6) Any other comments or suggestions on the proposed project?
All the comments received are positive on the project.

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In summary of the key result, 100% of those surveyed supported the project and thought that its positive impacts far outweighed the negative impacts. 100% of those surveyed were willing to get the solar cooker.

E.3. Report on how due account was taken of any comments received:

>>

The stakeholders (including local government and local residents) strongly supported the proposed project. Therefore, it is not necessary to make any adjustment on the current implementation plan.

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Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

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Direct tel:	
Personal E-Mail:	

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No official funds are involved in the proposed project.

Annex 3**BASELINE INFORMATION****2000-2007 Solar Irradiance Data in Pengyang County**²⁵

Month	Monthly solar insolation	Sunlight time	Solar irradiance rate
	(MJ/m ²)	(hour)	(W/m ²)
1	282	197.0	397.6
2	335	179.1	519.6
3	420	223.6	521.8
4	507	234.1	601.6
5	630	253.8	689.5
6	679	252.8	746.1
7	606	252.7	666.1
8	525	200.4	727.7
9	370	156.5	656.7
10	398	169.5	652.2
11	299	206.3	402.6
12	280	195.2	398.5
Annual Total	5331	2520.9	587.4

²⁵ Data from Ningxia Meteorological Archive.

Annex 4

MONITORING INFORMATION

The monitoring plan is in B.7.2. There is no additional information in this section.