



**CLEAN DEVELOPMENT MECHANISM  
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM  
(CDM-SSC-PoA-DD) Version 01**

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**NOTE:**

- (i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.
- (ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).



**SECTION A. General description of small-scale programme of activities (PoA)**

**A.1 Title of the small-scale programme of activities (PoA):**

Rural Household Biogas Digester Programme in Seven Regions of Sichuan Province

Current Version: 04

Complete Date: 28/11/2012

**A.2. Description of the small-scale programme of activities (PoA):**

**1. General operating and implementing framework of PoA**

Rural Household Biogas Digester Programme in Seven Regions of Sichuan Province (hereafter referred to as “the proposed PoA”) aims to reduce a large amount of greenhouse gases (GHG) by installing approximate 800,000 household biogas digesters (HBD) in seven regions (a region indicates a city or a prefecture) of Sichuan Province in the future years. The target seven regions are: Deyang City, Guangyuan City, Nanchong City, Bazhong City, Yaan City, Liangshan Prefecture and Panzhuhua City.

Sichuan Province is a big agricultural province in west China where the farmers have relatively low income. In the rural area of Sichuan, the farmers have the conventional custom of using deep pit for manure storage until it's used in the farmland as organic fertilizer. And the farmer household mainly use fossil fuel e.g. coal including coal briquette deprived from coal or Liquefied Petroleum Gas and firewood in thermal demand of daily cooking. However for the proposed PoA, only the households using one type of fossil fuel e.g. coal for cooking can be considered as targeted households in a CPA. By introducing biogas to the rural households, the management practice of a biogenic waste or raw material will be changed to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system and the coal will be replaced by biogas for cooking purpose.

The Coordinating/Managing Entity (CME) of the proposed PoA is Sichuan Wuhai Environmental Protection & Bioengineering CO., LTD. (hereafter referred to as “Wuhai Company”). Wuhai Company voluntarily conducts the coordinating action, takes charge the overall implementing and managing work of the PoA under which the household biogas digester construction and operation will be carried out at targeted farmer households.

In Sichuan Province, the authorized entities of biogas digesters construction and operation are the Rural Energy Office of Sichuan Province (SREO) and its affiliated local rural energy offices in city level and county level. Therefore, in order to facilitate the implementation of the proposed PoA, it's necessary for the CME to introduce them into the programme. The SREO and its subsidiaries will mainly responsible for carrying out CPA related activities under the conduction of the CME.



## 2. Policy/measure or stated goal of the PoA

Stated goal of the proposed PoA is to promote the rural households of the targeted seven regions in Sichuan to participate in the household biogas digester development programme and enable the utilization of biogas as clean energy for cooking purpose.

Expected outcome of the proposed programme is a large distribution of digesters with reliable operation of the installed systems. The effect will contribute to the success of the HBD development programme and increase the achieved emission reductions.

### *Contribution to sustainable development*

As stated and explained above, the target group of the proposed PoA are the rural household families. By limiting the applicability of the PoA to these groups, the PoA will contribute to sustainable development on the following aspects:

- Newly constructed biogas digesters for the treatment of animal manure can greatly decrease pollutants that causes environment pollution and lessen bad smell from traditional deep pit for animal manure storage;
- The transformation from the traditional deep pit to a new digester can improve hygiene conditions of the households and decrease pathogenic bacteria;
- The usage of biogas as clean energy can reduce atmosphere pollutants like smoke and NO<sub>x</sub>, which can improve air quality in the kitchen;
- Free use of biogas can avoid big consumption of coal and bring cost saving to the households;
- A number of biogas development related job opportunities will be provided to the local people.

## 3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

Up to now, there has been no mandatory policy or regulation force the installation of household biogas digesters by rural farmers; and there have been no mandatory laws or regulations requiring the organization of the proposed PoA by any entity. The coordinating/managing entity of the proposed PoA i.e. Wuhai Company aims to set up the PoA as a voluntary action for the purpose of getting CER revenue and plans all measures needed to enable the HBD development in the targeted regions. Therefore, the proposed PoA is a voluntary action by the coordinating/managing entity.

<b>A.3. <u>Coordinating/managing entity and participants of SSC-POA:</u></b>
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### 1. Coordinating or managing entity of the PoA as the entity which communicates with the Board



Sichuan Wuhai Environmental Protection & Bioengineering CO., LTD. is in charge of coordinating and managing of the PoA and also is responsible for communicating with the Board along with the PoA implementation.

**2. Project participants being registered in relation to the PoA.**

**Table 1 Project participants**

<b>Name of Party involved ((host) indicates a host Party)</b>	<b>Private and/or public entity(ies) project participants (as applicable)</b>	<b>Party involved wished to be considered as project participant (Yes/No)</b>
People's Republic of China (host)	Sichuan Wuhai Environmental Protection & Bioengineering CO., LTD.	NO
Switzerland	Bunge Emissions Holdings S.A.R.L.	NO

**A.4. Technical description of the small-scale programme of activities:**

**A.4.1. Location of the programme of activities:**

**A.4.1.1. Host Party(ies):**

People's Republic of China

**A.4.1.2. Physical/ Geographical boundary:**

The PoA covers the following seven regions territory of Sichuan Province: Deyang, Guangyuan, Bazhong, Nanchong, Yaan, Liangshan, Panzhuhua. It is difficult to give a precise GPS-coordinate of the boundary of these regions involved into the PoA because they are broad areas, however, the coordinates of these cities are given in the table below.

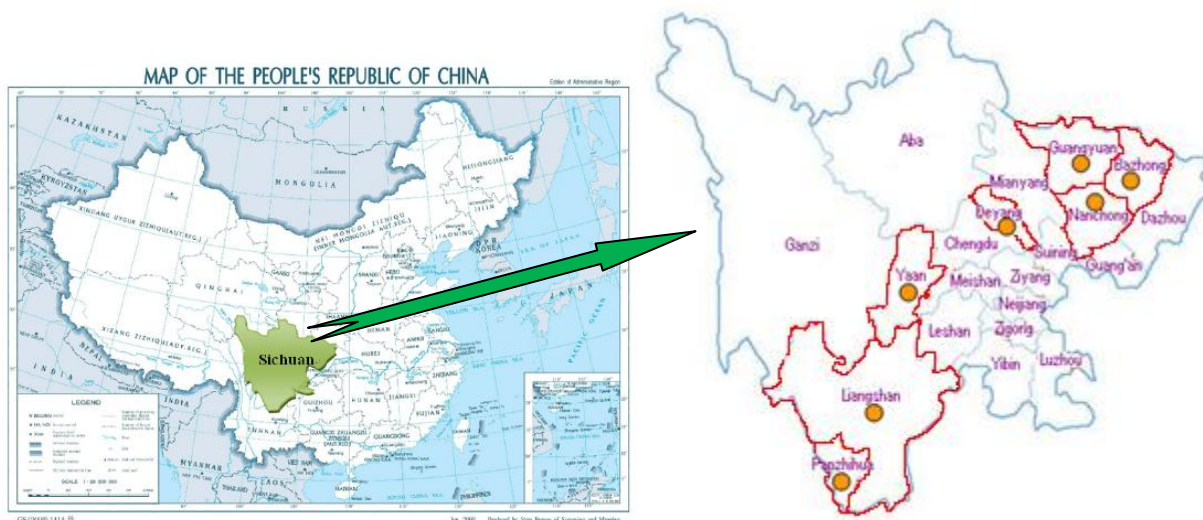
**Table 2 The coordinates of the seven cities/prefecture involved in the PoA**

<b>Region</b>	<b>Central Coordinates</b>	
	<b>Latitude</b>	<b>Longitude</b>
Deyang	31.1269 °(31 °7'37")	104.3980 °(104 °23'57")
Guangyuan	32.4354 °(32 °26'7")	105.8434 °(105 °50'36")
Bazhong	31.8679 °(31 °52'4")	106.7475 °(106 °44'51")
Nanchong	30.8378 °(30 °50'16")	106.1107 °(106 °6'39")
Yaan	29.9805 °(29 °58'50")	103.0133 °(103 °0'48")
Liangshan	27.8816 °(27 °52'54")	102.2673 °(102 °16'2")



Panzhihua	26.5823 °(26°34'56")	101.7186 °(101°43'7")
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The regions that are currently planned to introduce Household Biogas Digester are shown in the figure 1.



**Figure 1 PoA regions shown on the map**  
(The signals ● indicate the targeted regions in Sichuan province involved in PoA)

#### **A.4.2. Description of a typical small-scale CDM programme activity (CPA):**

A CPA is a specific implementation case of the PoA proposed by Wuhai Company that is based on the voluntary coordination action for household biogas digesters development.

A CPA under the proposed PoA involves the installation of a large number of household biogas systems and their normal operation during the crediting period at farmer households located within a confined geographical area in seven regions of Sichuan Province, China. To simplify management, validation and verification, the Coordinating/Managing Entity will try to include households in one CPA in a geographically reasonable way.

Generally, Wuhai Company will implement and manage the CPA, and the installation, operation, maintenance and other technical services will be primarily executed by SREO and the local rural energy office.

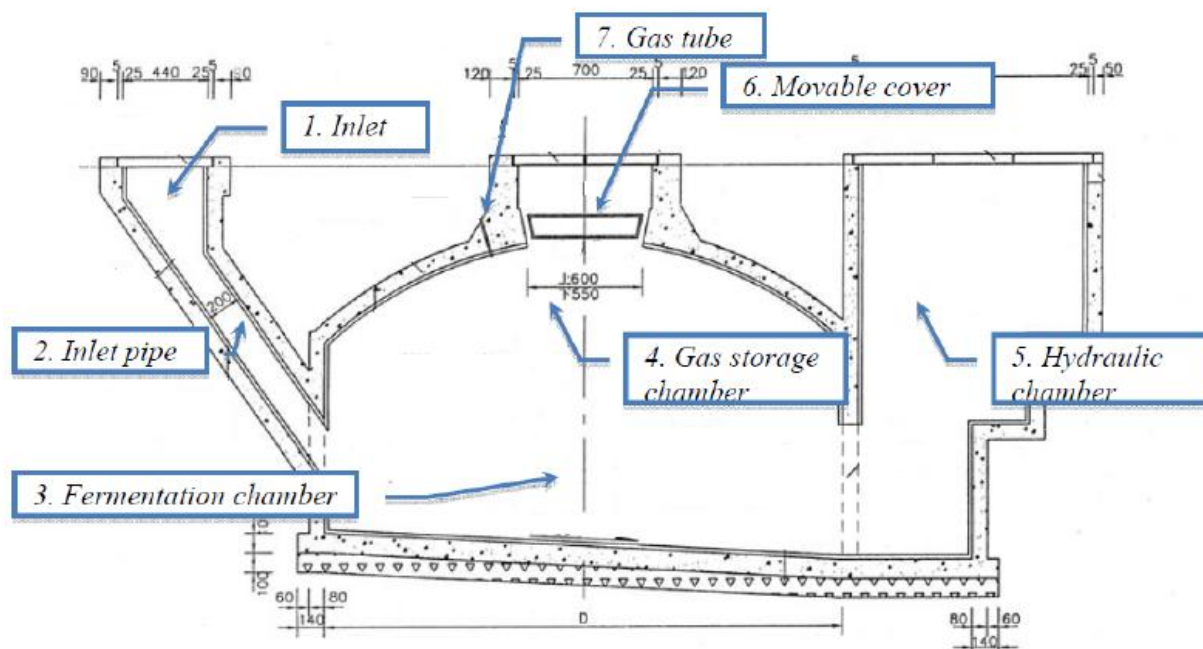
By installing biogas digesters in which animal and human manure produced by the households can be used to generate biogas, the existing deep pits that are used to store the manure will be abandoned and methane emissions will be avoided. All digesters within the CPAs will be installed in accordance with

national or provincial regulations and conducted by qualified and certified technicians from SREO and its subsidiaries. After the successful installation and commission, technical service will be offered by the servicemen to the participating households on a regular basis to ensure a stable operation and prevent a relapse to old habits.

The biogas generated by the biogas digester will be fed into the biogas stove newly equipped with the digester that can be used for cooking purpose. This will lead to a reduction consumption of fossil fuels that are used by the households for cooking and heating. As the biogas is a renewable resource, this will lead to a further reduction of CO<sub>2</sub> emissions. The residue effluent can be extracted from the biogas digesters easily and be used as organic fertilizer under an aerobic application of the sludge instead of additional CH<sub>4</sub> emissions.

**A.4.2.1. Technology or measures to be employed by the SSC-CPA:**

In the proposed PoA, the design of biogas digesters will comply with Chinese national standard of GB/T4750-2002 *Household Biogas Digester Standard* and/or the *Technical Requirements for Sichuan Provincial Rural Biogas Construction Government Loan Project*. The standard designs comprise digesters of 6 m<sup>3</sup>, 8m<sup>3</sup> and 10m<sup>3</sup>. All digesters constructed and included into the proposed PoA will follow either this standard or an applicable national or provincial version or updated that replaced the current one. The design and construction of the digesters is certified by technicians accredited by the Ministry of Agriculture. The typical structure of a biogas digester is displayed in Figure 2.



**Figure 2      Typical Structure of a household biogas digester**



As is shown in figure 2, a typical biogas digester system consists of different components such as inlet, inlet pipe, fermentation chamber, gas chamber storage, hydraulic chamber, cover and gas tube. The technical flow is described in detail as follows:

## **1. Biogas generation and collection system**

The biogas digester is usually installed below the pigpen and the inlet will be directly connected to livestock room so that the dung can be drained into the digester directly without being stored under anaerobic conditions before. Additionally, a toilet will be installed in each household next to the livestock room so that human excreta can be treated in the digester as well.

After being fed into the inlet of the whole system, the manure will reach the fermentation chamber where it is digested with a planned retention time of several months. Within the fermentation chamber, the main biogas generation takes place. The gas is stored in the upper part of fermentation chamber just above the slurry surface (the gas storage chamber). If more gas is generated than consumed, the pressure within the gas storage chamber will increase and press the liquids into the hydraulic chamber. When the gas is extracted for utilization via the gas tube, the pressure decreases again and allows the liquids to flow back into the fermentation chamber. This system guarantees a strict separation of the gas storage and the hydraulic chamber where the sludge can be extracted and used as organic fertilizer.

By placing the digester tank below the barns, a relatively stable temperature can be achieved within the digester. As the generation of biogas requires a warm environment, this is important to ensure the availability of gas without additional heating of the digester.

## **2. Biogas utilization system**

After the biogas is extracted from the gas storage chamber, it is led into desulphurization and dehydration units to purify the gas and extract harmful substances. Eventually, the gas will be fed into a biogas stove that can be used for cooking purpose, and thereby replace coal as fuel. To allow a proper gas flow control and completely shut the gas pipe when the stove is switched off, a pressure gauge will be installed.

Special maintenance procedures including cleaning the sulphide capture device and periodic controls and maintenance of the burners (cooking stoves, rice cookers, heaters, etc.) have been developed to ensure effective operation of the biogas system and proper utilization of digested slurry throughout the lifetime of the digester. To ensure the proper implementation of these methods, the technical service team that is set up during the Programme Activity will support the participating households.

All main equipments in the proposed PoA are domestically produced; the proposed PoA involves no technology and installations from abroad.



**A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:**

The eligibility criteria under the SSC-PoA shall be stated and checked in each SSC-CPA document as following:

- 1) The proposed CPA must be located within the geographical boundary of the PoA, i.e. the CPA shall lie within the following seven regions territory in Sichuan province: Deyang, Guangyuan, Bazhong, Nanchong, Yaan, Liangshan and Panzhihua.
- 2) Unique identifications of biogas digester subsystems included in a CPA that can indicate the programme shall be set for avoiding double counting of emission reductions.
- 3) The technology and process adopted by each biogas subsystem shall meet the *Technical Requirements for Sichuan Provincial Rural Biogas Construction Government Loan Project* adopted by SREO.
- 4) The start date of CPA should not be prior to 07/09/2011, i.e. the date that the PoA began to go through global stakeholder comment on UNFCCC website, and the CPA crediting period should not exceed the end date of PoA crediting period.
- 5) The CPA shall meet all the applicable requirements as per the applied methodologies AMS-I.I and AMS.III.R.
  - (a) Generates renewable thermal energy using biogas for use in residential applications.
  - (b) Comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying anaerobically emitting methane to the atmosphere in the absence of the project activity.
  - (c) Is limited to measures at individual households or small farms (e.g. installation of a domestic biogas digester). Methane recovery systems that achieve an annual emission reduction of less than or equal to five tonnes of CO<sub>2</sub>e per system.
  - (d) Have the habit of pig breeding and the animal manure generated is currently stored under anaerobic conditions in deep pits.
  - (e) The households currently use coal (including coal briquette) as fossil fuel source of energy for cooking purpose.
  - (f) Equip cook stoves with a rated capacity equal to or less than 150 kW thermal per household.
  - (g) The sludge must be handled aerobically.
  - (h) Measures shall be used to ensure that all the methane collected by the recovery system is destroyed.
- 6) The CPA shall remain within the threshold of small-scale project throughout the crediting period of the CPA, e.g. for small-scale CPA, the aggregated installed/rated thermal energy generation capacity





of all biogas systems included in the CPA is equal to or less than 45 MW thermal for AMS-I.I and the annual emission reduction shall not exceed 60kt CO<sub>2</sub>e for AMS-III.R.

- 7) The CPA shall meet the requirements pertaining to the demonstration of additionality, that is:
  - (a) The users of the technology/measure are isolated units (e.g. farmer households); and
  - (b) The installed capacity of each biogas cooking stove in household is no larger than 2250kW thermal<sup>1</sup>, and the emission reductions from avoiding methane emission of each household are no more than 3000 tonnes per year.
- 8) The biogas digesters included in a CPA shall be constructed and operated at rural households level.
- 9) The parameters deemed to be determined by sampling and survey shall meet the confidence/precision of 90/10 for annual measurement and 95/10 for biennial measurement.
- 10) The SREO and its local subsidiaries confirms that:
  - a) All biogas system to be newly installed under the CPA are not and will not be part of another CDM project or programme activity and that no CERs will be claimed for the biogas system other than those to be claimed by the CME on behalf of the participating households; and
  - b) That the SREO and its local subsidiaries are aware and agree with the inclusion of the CPA to the proposed PoA.
- 11) All CPAs will be exempted from performing de-bundling check. That's to say, each of the independent subsystems (the digester and biogas stove) is no larger than 1% of the small-scale thresholds defined by the methodologies applied (600 tCO<sub>2</sub>e emission reductions from methane avoidance, 450 kW thermal installed capacity of the stove<sup>2</sup>).
- 12) No funding from Annex I parties is provided for the CPAs.

**A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):**

The information presented here shall constitute the demonstration of additionality of the PoA as a whole.

- (i) The proposed PoA is a voluntary coordinated action;

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<sup>1</sup> 45MW × 5% = 2,250kW.

<sup>2</sup> 60ktCO<sub>2</sub>e × 1% = 600 tCO<sub>2</sub>e, and 45MW × 1% = 450 kW



There are no National/International regulations that mandate the implementation of the proposed PoA. While there are certain policies like *Chinese Renewable Energy Law* and *Chinese Energy Saving Law* that encourage and promote the proposed technology but they do not mandate its implementation. The PoA requires individual households to take voluntary action to participate in project activities. The proposed PoA invites eligible farm households to participate in the programme and to benefit from all the advantages technical services offered by the activity. Therefore, the proposed PoA is a completely voluntary coordinated action.

Furthermore, the CME Wuhai Company is a private company that voluntarily engages in the promotion of household biogas systems in Sichuan.

For households, they also have utter voluntary right to decide whether to participate into the PoA or not. If the households choose to participate into the PoA voluntarily, it means that they are willing to comply with corresponding requirements and can benefit from the implementation of the proposed PoA.

- (ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

The PoA aims to promote the development of household biogas digester in Sichuan rural area through the HBD programme of activities by getting expecting CER revenues. Without CDM, the CME has neither obligation nor necessity to manage the PoA. Therefore, it would not be implemented in the absence of the PoA.

- (iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

N/A. The PoA is not implementing a mandatory policy/regulation.

- (iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

N/A. This is not a mandatory policy/regulation enforced.

<b>A.4.4. Operational, management and monitoring plan for the <u>programme of activities</u> (PoA):</b>
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<b>A.4.4.1. Operational and management plan:</b>
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- (i) A record keeping system for each CPA under the PoA.



The CME will responsible for the development and maintenance of a record keeping system for each CPA. The record that is kept for each CPA is displayed in the table below. It comprises the main items and detailed information for each CPA.

**Table 3 Typical CPA record keeping system**

<b>Item</b>	<b>Comments</b>
CPA ID:	CPA-XX
CPA Location:	
Construction period	Indicate the earliest start construction date and the latest acceptance inspection date in the CPA
Household number within the CPA	
Estimated ER annually	
Contact Name of CPA Implementer	
Telephone Number:	
Fax Number:	
Email:	
Address:	
ZIP Code:	
Households database	See Table 4 below for detail.

In a specific CPA, a household database will be established and necessary information will be included in it like the following:

**Table 4 Example of Household database of a specific CPA**

Unique ID	Name	Country	Town	Village	Construct date	Digester volume	Final Check date	Technician
XX00001								
XX00002								
XX00003								
.....	.....	.....	.....	.....	.....	.....	.....	.....

- (ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA.

In order to avoid double accounting, the local Rural Energy Office will strictly examine the households whether they can satisfy all requirements of being involved into the PoA, that's to say, the households shall be checked and ensured that they: Take participant into the proposed PoA voluntarily; Use only coal rather than other fossil fuel like LPG for daily cooking purposed; Feed pigs and has deep pit to store manure for months before it's used as fertilizer. After the above check, every biogas subsystem installed and included into a CPA shall be indentified by the local Rural Energy Office using a unique ID number which respectively correspond the household owner. The unique ID number will be recorded in the household database kept by local Rural Energy Office and has the function to distinguish the CPA



digester with one already implemented digester that is not deemed to be included into the CPA. Thus the Household ID number will be used to clearly identify the single units for the proposed PoA.

For a further way of ensuring no double accounting occurs, the SREO and its local subsidiaries shall contrast and check the archive information of annual HBD construction to ensure that:

1. The CPA and all biogas systems to be installed under the CPA have not been and will neither be registered as a single CDM project activity nor as a CPA under another PoA.
2. The SREO and its local subsidiaries are aware and agree that the CPA will be subscribed to the present PoA.

- (iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

According to Guidelines on Assessment of De-bundling for SSC Project Activities, version 03(EB54, Annex 13), the CPA of a PoA is exempted from performing de-bundling check if each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA is no larger than 1% of the small-scale thresholds defined by the methodology applied, i.e. the CPA is considered as not being a de-bundled component of a large scale activity.

According to the methodologies applied, the small-scale thresholds are 60ktCO<sub>2</sub>e from type III category and 45MWth from type I category, thus 1% of the small-scale thresholds indicate 600 tCO<sub>2</sub>e emission reductions from methane avoidance, and 450 kW thermal installed capacity of the biogas stove. For a household, the volume of a digester is about six to ten cube meters, and according to estimation, the emission reduction from avoiding methane emission is no larger than 1 tCO<sub>2</sub>e. Another side, according to Chinese national standard of *Domestic Biogas Stove*<sup>3</sup>, the three specifications of installed capacity of a stove are 2.33kW, 2.79kW and 3.26kW with fluctuation range of  $\pm 10\%$ , e.g. the maximum of a stove will not exceed 3.59kW, any stove that cannot satisfy this standard shall not be permitted to be installed for a newly built digester, therefore none of them reaches 450kW thermal.

From above demonstration, it can be concluded that each subsystem is no larger than 1% of the small-scale thresholds. Therefore, all CPAs will be exempted from performing de-bundling check i.e., they are not a de-bundled component of a large-scale activity.

- (iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

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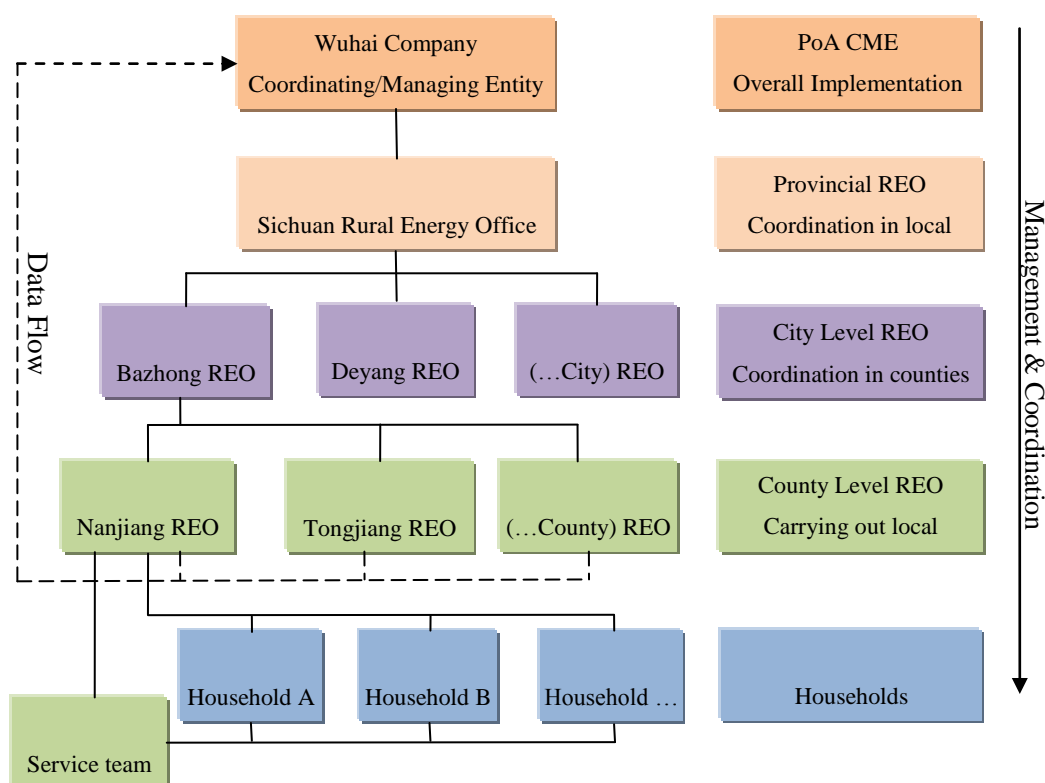
<sup>3</sup> GB/T 3606-2001 “Domestic biogas stove



As per the eligibility criteria for CPAs in section A.4.2.2 both the SREO and its subsidiaries and the households operating the biogas systems are aware and have agreed that their activity is being subscribed to the proposed PoA.

### Tentative Operating Framework of the PoA

In the paragraphs below a tentative operating structure for the PoA is described. In practice procedures, entities involved and their respective roles and tasks may differ from the tentative structure.



**Figure 3 Tentative operating structure for the PoA**

**Table 5 Main roles and the responsibilities of the proposed PoA**

Role	Main Responsibilities
Wuhai Company (CME)	Plan, conduct and manage the whole PoA, including obtaining LoA from DNA, , forming a new CPA and including it into the PoA, implementing the CPA, maintaining the record keeping system for CPAs. The CME will also be responsible for organizing verifications and representing the CPAs including all relevant data to the DOE and distributing the carbon revenues to support farmers, finance the technical service network, etc.
Sichuan Rural Energy Office	Coordinate REOs in city and county level for facilitating the



(SREO)	implementation of CPAs by the CME
City Level REO	Coordinate county level REOs in the city
County Level REO	Select the targeted households that can satisfy all the conditions for inclusion into the CPA and provide households list of the CPA, undertake baseline surveys and monitoring related activities guided by the CME, and manage local service teams
Service team	Provide regular maintenance and other technological services for the biogas digester where needed
Household	Ensure that the digester is well operating in the credit period of the CPA

#### **A.4.4.2. Monitoring plan:**

According to the Procedures for Registration of a Programme of Activities as a Single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities (version 04.1), the CME can choose to have all CPAs verified separately, or have a group of CPAs verified at the same time.

The CME intends that a verification of one CPA or more is carried out at the same time. In that case, verification should be carried out using a statistically sound sampling method/procedure complying with the latest *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities* issued by EB. For the purpose of verification and request for issuance of CERs, all monitoring reports of all CPAs shall be maintained by the CME in accordance with both the record keeping system identified in this PoA-DD and the method/procedure to be used for verification. Meanwhile, the CME shall make available all monitoring reports requested by the DOE for verification purposes.

#### **A.4.5. Public funding of the programme of activities (PoA):**

No public funding from Annex I countries is provided for the proposed programme of activities (PoA).

### **SECTION B. Duration of the programme of activities (PoA)**

#### **B.1. Starting date of the programme of activities (PoA):**

07/09/2011, the date of starting validation on UNFCCC website, which indicates the earliest starting date of the proposed PoA. The link of validation of the PoA is provided below:

<http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/Z37079IMS4ISXZV1GXDRKL4889PY58/view.html>

The crediting period of the PoA will start on 01/01/2013 or the date of being registered by EB, whichever is later.



**B.2. Length of the programme of activities (PoA):**

28 years

**SECTION C. Environmental Analysis**

**C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:**

1. Environmental Analysis is done at PoA level ☒

According to the Notice to Adjustment of Application Work on Rural Household Biogas CDM Project joint issued by China NDRC and Minister of Agriculture, since no EIA is required by the State and no EIA approval is conducted in real operation for this kind of project, the statement of avoiding EIA from local Environmental Department can be used instead the EIA approval. For this reason, an Environmental Impact Assessment (EIA) for household biogas digesters is not required either on PoA level or on CPA level. However, for a responsible attitude, a basic evaluation of the environmental impacts has been carried out on the PoA level.

2. Environmental Analysis is done at SSC-CPA level ☐

As an EIA for household biogas digester is not required by the Chinese governmental regulations and no EIA approval is conducted for this kind of project in real operation, the EIA was not conducted on the CPA level.

**C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

The environmental impact analysis that was carried out by the Sichuan Rural Energy Office came to the result that the proposed PoA is in line with all relevant national industrial policies and environmental requirements.

Furthermore, additionally to a global contribution to climate change mitigation by GHG reduction, the following environmental impacts have been identified:

- Through anaerobic treatment of swine manure and domestic sewage in biogas digester, agricultural area pollution will be reduced to a great extent.
- Odour pollution caused by the animal manure stored in an open pit without further treatment will be reduced.
- Through anaerobic treatment of farm-yard manure, water pollution and zoonotic diseases (diseases that can be transmitted from animals to people) will be reduced by improving the living environment of households and communities. Furthermore, due to the integrated toilet, kitchen



and animal shed facilities, the project will improve sanitary and hygienic conditions. This will help to reduce the risk of spreading infectious diseases.

- The household's indoor air quality will be improved by replacing coal, fire wood, and straw with clean biogas.

**C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA):**

For the household biogas digester construction, the environmental impact assessment (EIA) is required by NO laws/ regulations in China and no EIA approval is conducted in real operation. Therefore for a typical CPA, no EIA is needed and the EIA will not be included in the applicability criteria for the CPAs.

**SECTION D. Stakeholders' comments**

**D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:**

1. Local stakeholder consultation is done at PoA level ☒
2. Local stakeholder consultation is done at SSC-CPA level ☐

The most relevant stakeholders of the PoA are the huge amount of rural households within the physical boundary of the PoA and the related local rural energy systems. The rural energy systems in every level are almost similar in different cities/counties/towns. As to the farmer households in the seven different regions, they still have similar situation and habits, and with common concerns to the PoA. Therefore, the stakeholders' comments can be evaluated at PoA level.

**D.2. Brief description how comments by local stakeholders have been invited and compiled:**

18/12/2010, The CME invited delegates of all the city and county levels of Rural Energy Offices of the initial targeted seven regions to Chengdu for a comprehensive stakeholder meeting. During this meeting, the principle of carbon trading, the Clean Development Mechanism and the impacts to the work of the Rural Energy Offices have been presented.

In the presentations, special focus has been laid on the impacts that CDM will have to the households and the additional benefit that is offered by CDM. Additionally, the requirements for the baseline studies, the monitoring work and the distribution of carbon revenues have been introduced.

During the meeting, all present delegates have been encouraged to ask questions, express concerns and give ideas and suggestions. Several questions about the principle of CDM and emission trading have been discussed and explained. Additionally to an open discussion, questionnaires have been distributed to facilitate further comments and give the participants the chance to address open issues.





As to the households, during November and December of 2010, the CME (i.e. Wuhai Company) together with SREO had been to the cities of Deyang, Guangyuan, Bazhong, etc., and specially visited the farmer households accompanied with the staff from local REO. Opinions, problems, concerns, CDM factor and other key issues about the proposed PoA were addressed by the household farmers. Particularly, the CME had held a local stakeholder consultation meeting in Nanjiang County. Questionnaires were given to the stakeholders to consult their comments towards the project.

Besides, the CME also published to consult any comments from the stakeholders on the website with contact ways on it. What has been done above can ensure that the local stakeholders had been widely invited to give any comments on the proposed PoA.

**D.3. Summary of the comments received:**

As the proposed programme is implemented as financial and technical support to the rural household biogas digester development under the support of SREO and its local subsidiaries, the invited stakeholders have already been familiar with the technical process and no general concerns have been expressed.

Total 76 questionnaires were received by the CME, in which 42 questionnaires towards rural energy offices and 34 questionnaires towards famer households separately, and the analysis of the feedbacks is shown in the table 6 and table 7.

**Table 6 Feedback of questionnaires towards rural energy offices**

Main Question	Option	Number	Percentage
Do you know about CDM?	Yes	42	100%
	No	0	0%
Do you think the project can improve local environment?	Improve	42	100%
	No effect	0	0%
	Deteriorate	0	0%
Do you think the project can improve household's living condition?	Improve	42	100%
	No effect	0	0%
	Worsen	0	0%
Do you think the project can improve household's hygiene level?	Improve	42	100%
	No effect	0	0%
	Worsen	0	0%
Do you think the project can increase the household's positivity?	Increase	42	100%
	No effect	0	0%
	Decrease	0	0%
Do you support this project?	Support	40	95.2%
	Neutral	2	4.8%
	Against	0	0%

**Table 7 Feedback of questionnaires towards famer households**



Main Question	Option	Number	Percentage
Have you constructed biogas digester in your household?	Yes	7	20.6%
	No	27	79.4%
Do you think the project can improve local environment?	Improve	34	100%
	No effect	0	0%
	Deteriorate	0	0%
Do you think the project can improve household's living condition?	Improve	34	100%
	No effect	0	0%
	Worsen	0	0%
Do you think the project can improve household's hygiene level?	Improve	34	100%
	No effect	0	0%
	Worsen	0	0%
Do you think the project can increase the household's positivity?	Increase	34	100%
	No effect	0	0%
	Decrease	0	0%
Do you support this project?	Support	34	100%
	Neutral	0	0%
	Against	0	0%

From above results, a conclusion can be drawn that the staff of the rural energy offices and the household farmers regarded that the proposed PoA could bring many benefits to the local and they overall supported the implementation of the project.

**D.4. Report on how due account was taken of any comments received:**

The stakeholder meeting and the visit to households have shown that all invited stakeholders are positive towards the implementation of the CDM PoA and do not have negative concerns about the PoA. All questions have been discussed openly during the meeting.

**SECTION E. Application of a baseline and monitoring methodology**

**E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:**

A CPA included in the PoA will apply the following combination of methodologies:

AMS-I.I: *Biogas/biomass thermal applications for households/small users* (Version 03);  
AMS-III.R: *Methane recovery in agricultural activities at household/small farm level* (Version 02)

Both methodologies are approved for use in a PoA and are applicable in combination.



A CPA also refers to the following methodology:

AMS-III.D: *Methane recovery in animal manure management systems* (Version 18.0)

For more information about the methodologies, please refer to:

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

**E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:**

The specific applicability criteria of both methodologies, AMS-I.I and AMS-III.R will be discussed separately to ensure the correct application of the methodologies.

**Table 8 Relevant applicability criteria for AMS-I.I.**

<b>Criteria</b>	<b>Applicability of the proposed PoA</b>	<b>Applicable</b>
This category comprises activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional applications (e.g. for supply to households, small farms or for use in built environment of institutions such as schools). Examples of these technologies that displace or avoid fossil fuel use include but are not limited to biogas cook stoves, biomass briquette cook stoves, small scale baking and drying systems, water heating, or space heating systems.	The technology included under a CPA of the propose PoA supplies thermal energy for household users with biogas—which is a renewable energy technology—to replace coal.	Yes
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	The biogas stove to be installed to the household in the proposed PoA shall satisfy the requirements of corresponding Chinese national standard. According to Chinese national standard of GB/T 3606-2001 “Domestic biogas stove”, there may be three specifications of a stove with the installed capacity of 2.33kW, 2.79kW and 3.26kW and $\pm 10\%$ fluctuation limits are permitted to the capacity, which means the capacity of any biogas stove shall not exceed 3.59kW. For each CPA, the total installed/rated thermal energy generation capacity of the project equipment shall also be identified to ensure that it is equal to or less than 45 MW thermal.	Yes
Each unit (e.g. cook stove, heater) shall have a rated capacity equal to or less than	According to the national standard <sup>4</sup> , the biogas stove to be installed to each household	Yes

<sup>4</sup> GB/T 3606-2001 “Domestic biogas stove”



150 kW thermal. Projects that include units with rated capacity greater than 150 kW thermal may explore AMS I.C “Thermal energy production with or without electricity”.	has three values of rated thermal capacity which are 2.33kW, 2.79kW and 3.26kW with fluctuation range of $\pm 10\%$ , e.g. the maximum of a stove will not exceed 3.59kW. Therefore, the installed capacity of each unit will be less than 150 kW thermal.	
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is produced using solely renewable biomass <sup>4</sup> (more than one type of biomass may be used). Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded; (b) The .General guidance on leakage in biomass project activities . (attachment C to Appendix B of 4/CMP.1 Annex II) shall be followed; (c) The project participant can monitor the mass, moisture content and NCV of the resulting biomass fuel, through sampling that meets the confidence/precision level of 90/10; (d) Where the project participant is not the producer of the renewable fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of renewable biomass to account for any emissions associated with biomass production (as per 4 (b) above). Such a contract shall also ensure that there is no double counting of emission reductions.	N/A	N/A

**Table 9 Relevant applicability criteria for AMS-III.R.**

<b>Criteria</b>	<b>Applicability of the proposed PoA</b>	<b>Applicable</b>
This project category comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying anaerobically emitting methane to the atmosphere in the absence of the project activity. Methane emissions are prevented by: (a) Installing methane recovery and combustion system to an existing source of	In the absence of the project activity, the manure would be decaying anaerobically emitting methane to the atmosphere; While the project activity will change the management practice of a biogenic waste by installing a household biogas digester equipped with methane recovery and combustion system instead of existing deep pit in order to prevent methane emissions.	Yes



methane emissions, or (b) Changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.		
The category is limited to measures at individual households or small farms (e.g. Installation of a domestic biogas digester). Methane recovery systems that achieve an annual emission reduction of less than or equal to 5 tonnes of CO <sub>2</sub> e per system are included in this category. Systems with annual emission reduction higher than five tonnes of CO <sub>2</sub> e are eligible under AMS-III.D “Methane recovery in animal management systems”.	The installation of each biogas digester in the CPA under the proposed PoA is at individual households, as per the eligibility criteria for CPAs inclusions in section A.4.2.2, the individual devices will achieve emission reductions of less than 5 tCO <sub>2</sub> e.	Yes
This project category is only applicable in combination with AMS-I.C and/or AMS-I.I and/or AMS-I.E.	The proposed PoA and the involved CPAs combine methodologies AMS-I.I and AMS-III.R.	Yes
The project activity shall satisfy the following conditions: (a) The sludge must be handled aerobically. In case of soil application of the final sludge the proper conditions and procedures that ensure that there are no methane emissions must be ensured. (b) Measures shall be used (e.g. combusted or burnt in a biogas burner for cooking needs) to ensure that all the methane collected by the recovery system is destroyed.	The digester effluent (sludge) will be handled aerobically by using it on farm land as organic fertilizer; the biogas will be combusted through the biogas stove for cooking purpose by the farmer household. In case that the biogas collected is enough for cooking purpose and cannot be used out, the remaining biogas will be combusted by the household biogas stove for avoidance of methane emission to the atmosphere directly.	Yes
Aggregated annual emission reductions of all systems included shall be less than or equal to 60 kt CO <sub>2</sub> equivalent.	As per the eligibility criteria for CPAs inclusion in section A.4.2.2 it will be safeguarded that annual emission reduction of all systems included in one CPA will be less than or equal to 60 ktCO <sub>2</sub> e.	Yes

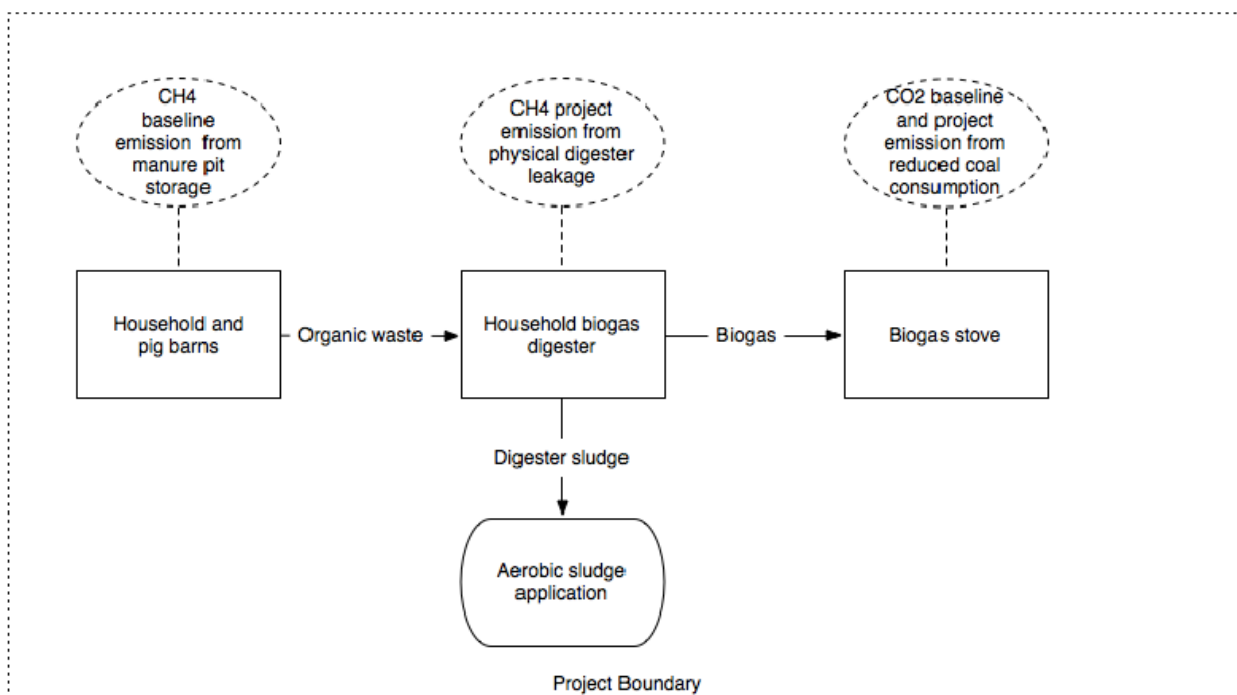
After above analysis of all applicability criteria of the involved methodologies, it can be concluded that the methodologies are applicable to the proposed PoA.

### **E.3. Description of the sources and gases included in the SSC-CPA boundary**

The applied methodology AMS-I.I defines the project boundary as the physical, geographical sites of the equipment producing thermal energy during the crediting period while under AMS-III.R the project boundary is the physical, geographical site of the methane recovery and combustion systems. Integrated the boundary definitions in the two methodologies, the geographic sites of all individual biogas systems



included in the CPA can define the SSC-CPA boundary. A biogas system consists of a bio digester and a cooking/combustion unit. The figure below visualizes the SSC-CPA boundary:



**Figure 4 Project boundary for one sample household**

Two different sources of GHG emissions are relevant for the proposed PoA and therefore included in its boundary:

**a) Methane emissions from existing manure management systems:**

Nearly all farmers and rural households with pigs use a deep pit as manure management system in the rural Sichuan Province. The storage in the pit for a retention time of longer than one month improves the fertilizer capacity of the manure and is the easiest way of handling the manure problem. However, this leads to the emission of methane that is generated due to the anaerobic conditions within the pit.

By installing biogas digesters, the generated methane will be captured and stored within the digester until it is utilized as energy source for cooking purpose. Thereby, the methane will be destroyed efficiently and its emission will be avoided.

**b) Carbon dioxide emissions from fossil fuel consumption:**

The predominant source of energy for cooking and heating in rural Sichuan is coal. Except for occasional events where straw or crop residues are available in little amounts, coal is used as main fuel for household purposes. As the biogas generated by the digesters can be stored within the device until it is used, the biogas can replace the fossil fuel as main fuel. Thereby, significant amounts of CO<sub>2</sub> emission will be reduced.



Additional to these explanations, the following table gives an overview on the emission sources included and excluded.

**Table 10 Sources of GHG emissions included/excluded in the project boundary**

	<b>GHG emission source</b>	<b>Gas</b>	<b>Included?</b>	<b>Justification/Explanation</b>
<b>Baseline Emission</b>	Thermal energy used for cooking purpose by fossil fuel consumption	<b>CO<sub>2</sub></b>	<b>Yes</b>	Major source of baseline emission.
		CH <sub>4</sub>	No	Excluded for simplification. This is conservative.
		N <sub>2</sub> O	No	Excluded for simplification. This is conservative.
	Existing manure management system	CO <sub>2</sub>	No	Excluded as decomposition of organic waste is CO <sub>2</sub> neutral.
		<b>CH<sub>4</sub></b>	<b>Yes</b>	Major source of baseline emission.
		N <sub>2</sub> O	No	Excluded for simplification. This is conservative.
<b>Project Emission</b>	Fossil fuel or electricity consumption used for digester system operation	CO <sub>2</sub>	No	No fossil fuel or electricity is needed for the operation or the biogas digester system.
		CH <sub>4</sub>	No	Not applicable
		N <sub>2</sub> O	No	Not applicable
	Thermal energy used for cooking purpose by fossil fuel consumption	<b>CO<sub>2</sub></b>	<b>Yes</b>	Major source of emission.
		CH <sub>4</sub>	No	Not applicable; in line with the applied methodologies.
		N <sub>2</sub> O	No	Not applicable; in line with the applied methodologies.
	Leakage from biogas digester	CO <sub>2</sub>	No	Excluded as decomposition of organic waste is CO <sub>2</sub> neutral.
		<b>CH<sub>4</sub></b>	<b>Yes</b>	It shall be assumed in accordance with the applied methodology
		N <sub>2</sub> O	No	Not applicable; in line with the applied methodologies.

**E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:**

The baseline emissions will be determined separately for both type of GHG emissions, each described in the related methodologies AMS-I.I and AMS-III.R.

**Baseline of AMS-III.R:**

*The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter are left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. Baseline emissions (BE<sub>y</sub>) are calculated ex ante using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach (please refer to the chapter ‘Emissions from Livestock and Manure Management’ under the volume ‘Agriculture, Forestry and other Land use’ of the 2006 IPCC Guidelines for National*



*Greenhouse Gas Inventories). Country/regional-specific values shall be used if available. The option in paragraph 9(a) and relevant formulae shown in paragraph 10 of AMS-III.D “Methane recovery in animal manure management systems” shall be used to calculate baseline emissions.*

For the proposed PoA, the baseline for the manure management system is the storage of manure in a deep pit for more than 1 month, and the organic matter are left to decay anaerobically in deep pits and methane is emitted to the atmosphere. This type of swine manure management is common practice in the rural areas of Sichuan province and the continuation of the present situation. The applicability criteria of the households shall be examined by the local rural energy office before they are included into a CPA, thus the choice of baseline can be ensured for all included households. The amount of manure that is produced and stored in the pit in the baseline scenario is determined by a comprehensive baseline study. The organic decay would emit methane emissions to the atmosphere.

#### **Baseline of AMS-I.I:**

*The baseline is the fuel consumption of the thermal application used or that would have been used in the absence of the project activity times an emission factor for the fossil fuel displaced.*

In the proposed PoA, only the households using coal is considered into a CPA. Therefore, the baseline is that the targeted households use coal for cooking and the combustion of coal would emit carbon dioxide emissions to the atmosphere.

**E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA):**

#### **E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:**

There is no specific procedure provided in the applied small scale methodologies to demonstrate the additionality of a typical CPA, therefore, the *Guidelines on the demonstration of additionality of small-scale project activities* (It has been issued as annex 27 at EB 68 meeting) is applied to assess the additionality.

The *Guidelines on the demonstration of additionality of small-scale project activities* (Version 09.0) says:

*Documentation of barriers is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds. The positive list comprises of:*

*(c) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size<sup>1</sup> of each unit is no larger than 5% of the small-scale CDM thresholds, that is the size of each unit under 750 kW<sub>installed</sub>*





*capacity or under 3,000 MWh of energy savings per year or 3,000 tonnes of emission reductions per year;*

For the proposed PoA, the users of the technologies/measures only involve rural farmer households, and they are all isolated units. For every biogas digester, according to Chinese national standard of *Domestic Biogas Stove*, the three specifications of installed capacity of a biogas stove are 2.33kW, 2.79kW and 3.26kW with fluctuation range of  $\pm 10\%$ . Namely, the maximum of a stove will not exceed 3.59kW, which can ensure that the installed capacity of biogas cooking stove in each household is no larger than 2,250kW thermal<sup>5</sup>. Moreover, because the volume of a new biogas digester for each household is deemed to be 6 to 10 cube meters, it is obviously that one single rural household cannot reach 3,000 tonnes of emission reductions per year at all).

From above description, the positive list (c) of the *Guidelines on the demonstration of additionality of small-scale project activities* can be met, and the CPAs under the PoA should be defined as automatically additional.

#### **E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:**

The demonstration in section E.5.1 showed that the CPAs under the PoA should be defined as automatically additional because the project activity can meet the positive list from the SSC guidelines. However for strengthen it, the criteria below are listed to be checked upon inclusion of every CPA to the proposed PoA.

#### **Criteria**

For a CPA under the proposed PoA:

- (1) The users of the technology/measure are isolated units (e.g. farmer households); and
- (2) The installed capacity of each biogas cooking stove in household is no larger than 2,250kW thermal, and the emission reductions from avoiding methane emission of each household are no more than 3,000 tonnes per year.

#### **E.6. Estimation of Emission reductions of a CPA:**

##### **E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:**

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<sup>5</sup> According to the footnote 16 of the Guidelines for demonstrating additionality of microscale project activities, it is multiply by 3 to derive thermal units from electrical units irrespective of the type of project or methodology applied, thus  $3 \times 750 \text{ kW}_e = 2,250 \text{ kW}_{th}$ .



**AMS I.I- Biogas/biomass thermal applications for households/small users (version 03):**

Two measures of renewable energy are included in this methodology, biogas and/or biomass. While the CPAs under the PoA only cover the biogas thermal application for households. Therefore, most of the methodology, excluded the parts and contents that only applicable to biomass, can be used in the CPAs.

***Options for ER calculation***

As per the applied methodology, the emission reductions of the project activity shall be determined using one of the options below:

Option 1: Based on avoided quantity of fossil fuel consumption (applicable only to biogas projects)

Option 2: Based on thermal energy generated

Here in the CPAs under the PoA, Option 2 is chosen for the calculation of the emission reductions.

***Leakage***

As per the methodology, if the energy generating equipment introduced by the project activity is transferred from outside the boundary to the project activity, leakage is to be considered.

In case of biogas digesters which are not part of a Type III CDM project activity:

- (a) Any leakage due to change in manure management practice shall be taken into account e.g. referring to methods provided in AMS-III.D “Methane recovery in animal manure management systems”;
- (b) Physical leakage of biogas shall be accounted for as per the methods specified under AMS-III.D “Methane recovery in animal manure management systems”.

As no energy generating equipment introduced by the project activity is transferred from outside the boundary to the project activity, and the biogas digesters are part of a Type III CDM project activity, so leakage need not be considered in the CPAs.

**AMS III.R–Methane recovery in agricultural activities at household/small farm level (version 02):**

***Baseline Emissions***

As to the applied methodology AMS III.R, the baseline emissions ( $BE_y$ ) are calculated ex ante using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach (please refer to the chapter ‘Emissions from Livestock and Manure Management’ under the volume ‘Agriculture, Forestry and other Land use’ of the 2006 IPCC



Guidelines for National Greenhouse Gas Inventories). Country/regional-specific values shall be used if available. The option in paragraph 9(a) and relevant formulae shown in paragraph 10 of AMS-III.D “Methane recovery in animal manure management systems” shall be used to calculate baseline emissions.

Paragraph 9(a) of AMS-III.D:

Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach (please refer to the chapter ‘Emissions from Livestock and Manure Management’ under the volume ‘Agriculture, Forestry and other Land use’ of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure ( $B_0$ ).

### ***Project emissions***

The digester does not need any use of fossil fuels or electricity for the operation of the system, so the project emission on this aspect is zero.

Project emission due to physical leakage of the digesters is estimated using one of the two options using the method indicated in paragraph 13 of AMS-III.D “Methane recovery in animal manure management systems”.

As per paragraph 13 of AMS-III.D,

- (a) 10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity:
- (b) Optionally a default value of  $0.05 \text{ m}^3 \text{ biogas leaked/m}^3 \text{ biogas produced}$  may be used for both options in paragraph 9 (a) and (b) as an alternative to calculations per equation 6 and equation 7.

Option (a) is chosen for the CPAs under the PoA.

### ***Leakage***

Paragraph 11 of the AMS-III.R says that if the methane recovery and combustion equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

However for the CPAs in the Proposed PoA, no methane recovery and combustion equipment transfer in and/or out will occur, therefore, leakage need not be considered.

**E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:**



### **1. AMS-I.I - Biogas/biomass thermal applications for households/small users (version 03)**

According to Option 2: Based on thermal energy generated, the emission reduction is calculated based on the thermal energy generated using the measured quantity of biogas (For this reason, the index of NCV in the applied methodology AMS-I.I is substituted from biomass to biogas during its real application to this PoA). To distinguish the emission reductions from the methane emissions (which are covered under AMS-III.R.), an additional index FF is applied to ERY:

$$ER_{FF,y} = \sum_k N_{k,0} * n_{k,y} * BS_{k,y} * EF * \eta_{PJ/BL} * NCV_{biogas} - LE_y \quad (1)$$

$$EF = \sum_j x_j * EF_{FF,j} \quad (2)$$

Where:

$k$	Index for the type of thermal applications introduced by the project activity (e.g. cook stove, water heater)
$j$	Index for the type of baseline fossil fuel consumed
$N_{k,0}$	Number of thermal applications $k$ commissioned
$n_{k,y}$	Proportion of $N_{k,0}$ that remain operating in year $y$ (fraction)
$EF$	CO <sub>2</sub> emission factor (tCO <sub>2</sub> /GJ)
$x_j$	is a fraction representing fuel type $j$ used by the baseline thermal applications displaced by biogas
$BS_{k,y}$	The net quantity of renewable biomass or biogas consumed by the thermal application $k$ in year $y$ (mass or volume units, dry basis)
$\eta_{PJ/BL}$	Ratio of efficiencies of project equipment and baseline equipment (e.g. cook stove using coal) measured once prior to validation applying the same test procedure (e.g. lab test), as per a national or an international standard. Official data or scientific literature can be used for cross-check purposes
$NCV_{biogas}$	Net calorific value of the biogas, use default value: 0.0215 GJ/m <sup>3</sup> (assuming NCV of the methane: 0.0359 GJ/m <sup>3</sup> , default methane content in biogas: 60%)

#### **1.1 Identification of CO<sub>2</sub> emission factors of fossil fuel $EF_{FF,j}$**

There is only one type of fossil fuel, e.g. coal used in the baseline, that is, the index  $j$  will be coal (the coal type may be different among the CPAs including different regions), and the  $x_j$  will be regarded as 100%.



The CO<sub>2</sub> emission factors can be expressed by  $EF_{Coal}$  and from IPCC 2006, the value is obtained as 94.6 tCO<sub>2</sub>e/TJ.

## 1.2 Identification of $\eta_{PJ/BL}$

The project equipment will be the biogas stove, and the baseline equipment is the cook stove using coal (*Coal fired stove*).

For the biogas stove, the test efficiency ( $\eta_{PJ}$ ) is 59.3%<sup>6</sup>, and the corresponding National Standard *GB/T3606-2001 Domestic Biogas Stoves* requires that the efficiency of the biogas applications shall reach at least 55%. Here as a conservation way, 55% is regarded as the value for calculation.

For the coal fired stove, the applied methodology requires the efficiency of baseline equipment to be measured once prior to validation applying the same test procedure. The CME thus entrusted a qualified entity to measure the efficiency of a typical coal fired stove prior to validation<sup>7</sup>, and the test report showed the result below:

- The efficiency of the coal fired stove ( $\eta_{BL}$ ) is 16.87%

According to relevant literatures, the highest of the measured efficiency values of the coal stoves is 20% which is elaborated in the report: *Edwards R, et al., 2004, Improved Household Stoves in China: An Assessment of the National Improved Stove Program (NISP) and article in Energy Policy 32 (2004)395–411; Implications of changes in household stoves and fuel use in China.*

Therefore, for a conservative way,  $\eta_{PJ/BL} = 55\%/20\% = 2.75$ .

## 1.3 Leakage

As stated in section E.6.1, the leakage need not be considered in the CPAs, so **LE = 0**.

## 2. AMS III.R-Methane recovery in agricultural activities at household/small farm level

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<sup>6</sup> Test Report of household biogas stove.

<sup>7</sup> Test Report of rural household coal fired stove.



The ERs is calculated as  $ER_y = BE_y - PE_y - Leakage$  according to the applied methodology, where the BEy is the baseline emission, PEy is the project emission.

## 2.1 Baseline emissions

To distinguish the parameters of emission reductions from the carbon dioxide emissions which are covered under AMS-I.I., an additional index CH<sub>4</sub> is applied to BEy, PEy and ERY covered in AMS-III.R.

As to the referred paragraph 10 of AMS-III.D, in case option in paragraph 9(a) is chosen, baseline emissions are determined as follows:

$$BE_{CH_4,k,y} = GWP_{CH_4} * D_{CH_4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \quad (3)$$

Where:

$BE_{CH_4,k,y}$	Baseline emissions due to avoid of methane emission in city k in year y (tCO <sub>2</sub> e)
$GWP_{CH_4}$	Global Warming Potential (GWP) of CH <sub>4</sub> (21)
$D_{CH_4}$	CH <sub>4</sub> density (0.00067 t/m <sup>3</sup> at room temperature (20 °C) and 1 atm pressure)
$LT$	Index for all types of livestock
$j$	Index for animal manure management system
$MCF_j$	Annual methane conversion factor (MCF) for the baseline animal manure management system $j$
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type $LT$ (m <sup>3</sup> CH <sub>4</sub> /kg dm)
$N_{LT,y}$	Annual average number of animals of type $LT$ in year y (numbers)
$VS_{LT,y}$	Volatile solids for livestock $LT$ entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system $j$
$UF_b$	Model correction factor to account for model uncertainties (0.94)

## 2.2 Project emissions

Project emissions due to physical leakage of biogas from the animal manure management systems used to produce, collect and transport the biogas to the point of flaring or gainful use is estimated as per referred paragraph 13 of AMS-III.D,



- (a) 10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity:
- (i) In case option in paragraph 9(a) is chosen, it is determined as:

$$PE_{CH_4,k,y} = 0.10 * GWP_{CH_4} * D_{CH_4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (4)$$

Where:

$MS\%_{i,y}$  Fraction of manure handled in system  $i$  in year  $y$

The adopted methodology AMS-III.R does not give a detailed formula to determine the parameter of  $VS_{LT,y}$ , however according to its meaning, its value can be calculated with the following formulae:

$$VS_{LT,y} = VS_{(T)} * D_y \quad (5)$$

Where:

$VS_{(T)}$  Daily volatile solid excreted for livestock category  $T$ , kg dry matter/animal/day

$D_y$  Basis for calculating annual VS production, days/yr (the value is 365)

### 2.3 Leakage

As stated in section E.6.1, the leakage need not be considered in the CPAs, so **LE = 0**.

### 2.4 Emission reduction

Based on baseline emission and project emission, the annual emission reduction can be calculated:

$$ER_{CH_4,y} = \sum_k N_k * (BE_{CH_4,k,y} - PE_{CH_4,k,y}) \quad (6)$$

Where:

$N_k$  Number of households with active biogas digester located in city  $k$ , included in the CPA.

### 3. Total emission reductions for a specific CPA

The emission reductions of all households of one specific CPA in year  $y$  are:



$$ER_y = ER_{FF, y} + ER_{CH_4, y} \quad (7)$$

**E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:**

<b>Data / Parameter:</b>	$VS_{(T)}$
Data unit:	kg dry matter head <sup>-1</sup> day <sup>-1</sup>
Description:	Daily volatile solid excreted per animal T.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10, Table 10A-7(market swine).
Value applied:	0.27
Justification of the choice of data or description of measurement methods and procedures actually applied :	The types of swine in Sichuan Province belong to different regions including North America, Europe and Asia. From IPCC2006, the VS value for swine from North America is 0.27, and VS value for swine from any other regions is 0.3. Here for conservation, 0.27 is selected as the applied value.
Any comment:	

<b>Data / Parameter:</b>	$D_y$
Data unit:	day
Description:	Days per year, it's for calculating annual VS production.
Source of data used:	
Value applied:	365
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$B_{0,LT}$
Data unit:	m <sup>3</sup> CH <sub>4</sub> /kg
Description:	Maximum methane producing capacity for manure produced by livestock, of VS excreted.
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10, Table 10A-7(swine).
Value applied:	0.29
Justification of the choice of data or description of measurement methods and procedures actually applied :	The types of swine in Sichuan Province belong to different regions including North America, Europe and Asia. From IPCC2006, the B <sub>0</sub> value for swine from North America is 0.48, and the B <sub>0</sub> value for swine from Europe is 0.45, and from Asia is 0.29. Here for conservation, 0.29 is selected as the applied value.
Any comment:	





<b>Data / Parameter:</b>	$GWP_{CH_4}$
Data unit:	NA
Description:	Global Warming Potential of CH <sub>4</sub> .
Source of data used:	Methodology AMS-III.D referenced in the adopted methodology AMS-III.R
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$D_{CH_4}$
Data unit:	t/m <sup>3</sup>
Description:	CH <sub>4</sub> density
Source of data used:	Methodology AMS-III.D referenced in the adopted methodology AMS-III.R
Value applied:	0.00067 at room temperature (20 °C) and 1 atm pressure
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$UF_b$
Data unit:	NA
Description:	Model correction factor to account for model uncertainties
Source of data used:	Methodology AMS-III.D referenced in the adopted methodology AMS-III.R
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$MCF_j$
Data unit:	%
Description:	Annual methane conversion factor (MCF) for the baseline animal manure management system $j$
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10, Table 10A-7 and Table 10.17(swine).



Value applied:	29
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$MS\%_{Bl,j}$
Data unit:	%
Description:	Fraction of manure handled in baseline animal manure management system $j$ (i.e. anaerobically stored in the deep pit)
Source of data used:	According to the real manure management practice of the households.
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	Only one animal manure management system e.g. the manure is anaerobically stored in the deep pit, so the fraction is regarded as 1.
Any comment:	

<b>Data / Parameter:</b>	$EF_{Coal}$
Data unit:	t CO <sub>2</sub> e/TJ
Description:	Emission factor of coal
Source of data used:	Table 2.2 Chapter 2, Volume 2, IPCC 2006
Value applied:	94.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	In Sichuan Province, the rural households may use the following types of coal: Anthracite, Other Bituminous Coal, and Lignite, with respective emission factor of 98.3, 94.6, and 101.0. Here the value of 94.6 is selected in a conservative way.
Any comment:	

<b>Data / Parameter:</b>	$\eta_{PJ/BL}$
Data unit:	ratio
Description:	Ratio of efficiencies of project equipment and baseline equipment (e.g. cook stove using coal)
Source of data used:	Calculation by measured values prior to validation
Value applied:	2.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see E.6.2. in PoA-DD for detail.



applied :	
Any comment:	The value is a conservative value based on a tested value crosschecked against the figures from the literatures.

**E.7. Application of the monitoring methodology and description of the monitoring plan:**

**E.7.1. Data and parameters to be monitored by each SSC-CPA:**

<b>Data / Parameter:</b>	<b>T</b>
Data unit:	°C
Description:	Mean annual temperature in city <i>k</i> involved in the CPA. This parameter determines the emission factors of the existing manure management systems.
Source of data to be used:	Data from the latest available Sichuan Statistical Yearbook.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Determined by the Specific CPA.
Description of measurement methods and procedures to be applied:	This value is determined by the annual average temperature of the city from the latest Sichuan Statistical Yearbook.
QA/QC procedures to be applied:	
Any comment:	

<b>Data / Parameter:</b>	$N_{LT,y}$
Data unit:	head
Description:	Annual average animal population at the household.
Source of data to be used:	Survey methods.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	4.65
Description of measurement methods and procedures to be applied:	Sampling monitoring survey annually with a sampling size determined following the applied methodologies or the latest sampling standard.
QA/QC procedures to be applied:	To determine the monitoring parameters, a sample study will be for the CPAs to be verified. In line with methodology, the confidence interval is 90%, while the margin of error is 10%.
Any comment:	



<b>Data / Parameter:</b>	$MS\%_{i,y}$
Data unit:	%
Description:	Fraction of manure handled in project animal manure management system $i$ (i.e. digestion in the newly installed biogas digester)
Source of data to be used:	Sampling survey.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100 should be used for estimating the emission reduction since the project animal manure management is only the digestion in the newly installed biogas digester.
Description of measurement methods and procedures to be applied:	An annual sampling monitoring survey during monitoring a period with a sampling size determined following the applied methodologies or the latest sampling standard.
QA/QC procedures to be applied:	
Any comment:	

<b>Data / Parameter:</b>	<b>Sludge application</b>
Data unit:	NA
Description:	The proper soil application of the final sludge from the digester which shall be handled aerobically for not resulting in methane emissions.
Source of data to be used:	Sample survey.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	It's not needed for calculating expected emission reductions.
Description of measurement methods and procedures to be applied:	It shall be verified once during a monitoring period on a sampling basis.
QA/QC procedures to be applied:	
Any comment:	

<b>Data / Parameter:</b>	$N_{k,0}$
Data unit:	NA
Description:	Number of thermal applications $k$ commissioned.
Source of data to be used:	Commission record
Value of data applied for the purpose of calculating expected	Determined by the Specific CPA.



emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	After the installation of the bio-digesters and biogas stoves, they shall be inspected as acceptance testing (commissioning) for proper operation in compliance with specifications. The acceptance check date of each subsystem shall be recorded.
QA/QC procedures to be applied:	The systems should be operated in compliance with manufacturer required maintenance at least once every two years (biennial) during the crediting period. A statistically valid sample of the residences where the systems are installed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine the percentage of systems operating, as per the relevant requirements for sampling in the .General guidelines for sampling and surveys for small-scale CDM project activities.
Any comment:	

<b>Data / Parameter:</b>	$n_{k,y}$
Data unit:	%
Description:	Proportion of $N_{k,0}$ that remain operating at year y (fraction)
Source of data to be used:	Sampling survey
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	The CME will inspect that the biogas units are operational and in compliance with the required maintenance procedures from the manufacturers at least every two years during the crediting period. Monitoring will be done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95%confidence interval and a 5% margin of error. If the inspection happens on an annual basis, a confidence interval of 90%and 10%error margin can be applied.
QA/QC procedures to be applied:	The systems should be operated in compliance with manufacturer required maintenance at least once every two years (biennial) during the crediting period. A statistically valid sample of the residences where the systems are installed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine the percentage of systems operating, as per the relevant requirements for sampling in the .General guidelines for sampling and surveys for small-scale CDM project activities.
Any comment:	

<b>Data / Parameter:</b>	$BS_{k,y}$
Data unit:	Volume units, m <sup>3</sup>
Description:	The net quantity of renewable biogas consumed by the thermal application k in year y
Source of data to be	Sampling surveys



used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	350
Description of measurement methods and procedures to be applied:	<p>Gas meters are used to monitor accumulated biogas supplied to thermal energy equipment.</p> <p>Measurement campaigns shall be undertaken at selected sites. At least five campaigns per digester type (e.g. 6 cubic metre or 8 cubic metre capacity, fixed dome or floating dome, region with high average ambient temperature or low average annual temperature) shall be carried out in each year of the crediting period. Continuous measurement made for at least one month at a single digester is considered as a campaign.</p> <p>Monthly average value is annualised taking into account seasonal variation in gas production which is mainly a function of ambient temperature.</p>
QA/QC procedures to be applied:	The systems should be operated in compliance with manufacturer required maintenance at least once every two years (biennial) during the crediting period. A statistically valid sample of the residences where the systems are installed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine the percentage of systems operating, as per the relevant requirements for sampling in the .General guidelines for sampling and surveys for small-scale CDM project activities.
Any comment:	

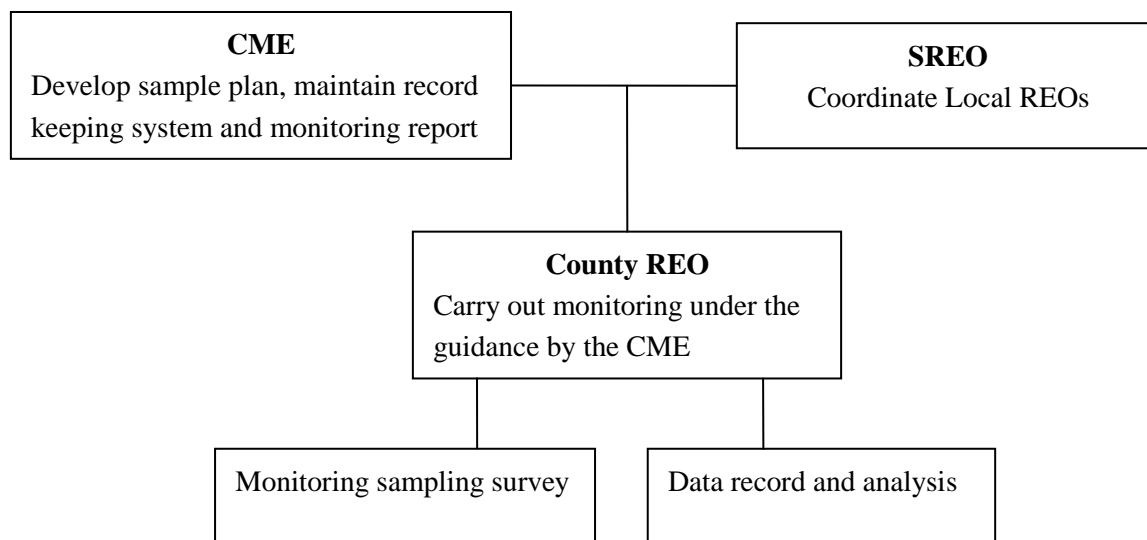
<b>Data / Parameter:</b>	$NCV_{Biogas}$
Data unit:	GJ/m <sup>3</sup>
Description:	Net calorific value of the biogas
Source of data to be used:	Applied methodology AMS-I.I.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0215
Description of measurement methods and procedures to be applied:	Obtained from the applied methodology AMS-I.I
QA/QC procedures to be applied:	
Any comment:	

**E.7.2. Description of the monitoring plan for a SSC-CPA:**



The monitoring plan that will be followed for each CPA is given below.

1. Organizational setup



**Figure 5 Structure for monitoring organization**

The Sichuan Rural Energy Office will facilitate the CME to guide the local REOs for carrying out monitoring of the CPAs. The data will be collected and recorded by county REO and forwarded to the CME to complete record keeping system and based on which the monitoring report for each CPA will be prepared.

2. Data monitored

The data to be monitored and the methods and procedures for monitoring are described in Section E.7.1.

3. Monitoring sampling study

For conducting monitoring, the CME has developed a sample plan consistence with the requirements by the latest Standard for sampling and surveys for project activities and programme of activities. The monitoring shall comply with the sample plan.

**Sampling Plan**

(a) Sampling Design:

- **Objectives and Reliability Requirements:**



The objective is determining the mean value or the percentage of the monitoring parameters that to be determined by sampling and surveys. These parameters with the description of their reliability requirements are contained in section E.7.1.

● **Target Population:**

The target population is the whole households in the proposed PoA which includes the households in the following seven regions (e.g. cities/prefectures) in the Province of Sichuan: Deyang, Guangyuan, Bazhong, Nanchong, Yaan, Liangshan and Panzhihua. The Sichuan Yearly Book gives data such as the average annual temperature, the domestic pure income, etc. by the division of each city/prefecture, and the construction of household biogas digester is conducted by the Rural Energy Office at each city level under the guidance of Rural Energy Office of Sichuan Province (SREO). Pertaining to the volume of biogas digester to be newly constructed for each household, it may have the possibilities of being or not being the same in each region. In case of the same volume, the households can be regarded as of harmonious in a CPA or a batch of CPAs to be verified at the same time, while in case of different volumes, the households cannot be regarded as of harmonious.

● **Sampling Method:**

If the volumes of the biogas digesters are the same in CPA(s), simple random sampling can be selected as the sampling method. However if the volumes of the digesters differ in CPA(s), stratified random sampling should be selected as the sampling method. In the case of different volumes of biogas digesters, each type of volume should be regarded as a stratum, then sampling should be conducted separately from each stratum.

● **Sample Size:**

The sample size for the CPA shall be calculated by corresponding formula of selected sampling method provided by the GUIDELINES FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES and based on necessary information below: the parameter of interest, the value it is expected to take and an estimate of the variance associated with the data, as well as the level of confidence and precision (if the parameter of interest is a proportion, or a percentage, then there is no need to specify a variance estimate).

- (1) In case of one type of digester volume, the simple random sampling will apply to the CPA. There are two types of parameters of interests: mean value or proportion.

Pertaining to proportion parameters, the equation used to calculate sample size is as the following:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$





Where:

$n$  Sample size

$N$  Total number of households

$p$  Our expected proportion (0.50)<sup>8</sup>

1.645 Represents the 90% confidence required

0.1 Represents the 10% relative precision ( $0.1 \times 0.5 = 0.05 = 5\%$  points either side of  $p$ )

Pertaining to mean value parameter i.e.  $N_{LT,y}$ , the equation used to calculate sample size is:

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \left( \frac{SD}{mean} \right)^2$$

$n$  Sample size

$N$  Total number of households

Mean Our expected mean<sup>9</sup>

SD Our expected standard deviation<sup>9</sup>

1.645 Represents the 90% confidence required

0.1 Represents the 10% relative precision

- (2) In case of more than one type of digester volume, the stratified random sampling will apply to the CPA. There are also two types of parameters of interests: mean value or proportion.

Pertaining to proportion parameters, the equation used to calculate sample size is as the following:

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

Where:

<sup>8</sup> This assumes that 50% of the biogas digester subsystems would be operating. If we changed our prior belief of the underlying true percentage of working stoves  $p$ , this sample size would need recalculating.

<sup>9</sup> As per paragraph 41 of Guidelines for sampling and surveys for cdm project activities and programme of activities Version02.0 (EB69 Annex5), the value can be obtained from these ways: (a) We may refer to the result of previous studies and use these results; (b) In a situation where we do not have any information from previous studies, we could take a preliminary sample as a pilot and use that sample to provide our estimates; (c) We could use “best guesses” based on the researcher’s own experiences.



$n$  Sample size

$N$  Total number of households

$$V = \frac{SD^2}{\bar{p}^2} = \frac{\text{overall variance}}{\bar{p}^2}$$

$\bar{p}$  The overall proportion

To then decide on the number of households in the sample that come from each type of digester volume, we could use proportional allocation, where the proportions of units from the different volumes in the sample are the same as the proportions in the population. This gives

$$n_i = \frac{g_i}{N} \times n$$

, where  $i=1, \dots, k$  and  $k$  is the digester types of volume in the CPA.

Where:

$g_i$  Size of the  $i^{\text{th}}$  group (digester volume) where  $i=1, \dots, k$

$N$  Population total

The calculation of the overall variance and proportion are as below:

$$SD^2 = \frac{(g_a \times p_a(1 - p_a)) + (g_b \times p_b(1 - p_b)) + (g_c \times p_c(1 - p_c)) + \dots + (g_k \times p_k(1 - p_k))}{N}$$

$$\bar{p} = \frac{(g_a \times p_a) + (g_b \times p_b) + (g_c \times p_c) + \dots + (g_k \times p_k)}{N}$$

Pertaining to mean value parameters, the equation used to calculate sample size is:

$$n \geq \frac{1.645^2 \times NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \left( \frac{SD}{\text{mean}} \right)^2$$

$SD$  Is the overall standard deviation, and

$\text{Mean}$  Is the overall mean.

The calculation of Overall Standard Deviation is according to the following:

$$SD = \sqrt{\frac{(g_a \times SD_a^2) + (g_b \times SD_b^2) + (g_c \times SD_c^2) + \dots + (g_k \times SD_k^2)}{N}}$$

Where:

$SD$  Weighted overall standard deviation



$SD_i$  Standard deviation of the  $i^{th}$  group where  $i=1, \dots, k$ , (note that these are all squared – so the group size is actually being multiplied by the group variance)

$g_i$  Size of the  $i^{th}$  group where  $i=1, \dots, k$

$N$  Population total

$$mean = \frac{(g_a \times m_a) + (g_b \times m_b) + (g_c \times m_c) + \dots + (g_k \times m_k)}{N}$$

Where:

$Mean$  Weighted overall mean

$m_i$  Mean of the  $i^{th}$  group where  $i=1, \dots, k$

- **Sampling Frame:**

The sampling frame is the whole households with newly built biogas digesters in the CPA or the batch of CPA to be verified at the same time.

(b) Data:

- **Field Measurements:**

Please see the variables and their timing and frequency of surveys in corresponding section in specific CPA-DD.

- **QA/QC:**

- Training of field personnel will be conducted before sampling survey;
- Notice households to wait home before investigation;
- Extend minimum sample size calculated to ensure the completeness of data, etc.
- In case of outlier occurs and the result of sampling and surveys cannot meet the required reliability (confidence/precision), necessary measures shall be taken to ensure the data can meet the reliability.

- **Analysis:**

The data will be converged and the mean value or percentage of each parameter will be calculated.

(c) Implementation:

- **Implementation Plan:**

- Sampling targets: Identify the households to be investigated during the surveys;
- Schedule for implementing: arrange the time and routine for surveys;
- Qualifications and experience of personnel: All investigators will be trained prior to the surveys.

For the purpose of verification and request for issuance of CERs, all monitoring reports of all CPAs shall be maintained by the CME in accordance with both the record keeping system identified in this PoA-DD



and the method/procedure to be used for verification. Meanwhile, the CME shall make available all monitoring reports requested by the DOE for verification purposes.

#### 4. Data Management and Quality Control

The tentative system of data management and quality control is described below. As the system is improved constantly, improvements to increase the data accuracy might be implemented. In such case, all improvements will be documented and clearly described in all subsequent documents such as CPA-DDs and Monitoring Reports and provided to all involved stakeholders.

##### 1) Supervisor Check

When conducting monitoring data collection, the interviewer needs to review the questionnaires. Data on the questionnaires need to be subject to range checks (outlier data), checks against reference data, skip checks, consistency checks and typographic checks, etc.

##### 2) Data Entry and Data Check Algorithms

While data entry, the data will be checked for inconsistencies, missing values, identification numbers, double data entry.

##### 3) Analytical Checks

By basic descriptive statistics, the outliers will be figured out and then further statistical analysis can work out more characteristics of the data.

#### 5. Data Archives

The electronic data will be collected and structured by the local Rural Energy Offices and the data together with the hard copies will be forwarded to the CME. All data and documents will be archived by the CME and provided to the verifying DOE on demand.

All data and documents will be archived by the CME at two different locations to avoid data loss and allow a data restore in the unlikely event of a data loss. All data will be stored until at least two years after the CPA crediting period is finished.

<b>E.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)</b>
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Date of completion of the application of the baseline study and monitoring methodology: 28/11/2012.



Name of responsible persons:

Mr. Yong Wang

CDM Project Manager

Sichuan Wuhai Environmental Protection & Bioengineering CO., LTD.

[wywyatt@163.com](mailto:wywyatt@163.com)



**Annex 1**

**CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and  
PARTICIPANTS IN THE PROGRAMME of ACTIVITIES**

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**SMALL-SCALE CDM PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM  
(CDM SSC-PoA-DD) - Version 01**



**CDM – Executive Board**

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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

NA





**Annex 3**

**BASELINE INFORMATION**

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**Annex 4**

**MONITORING INFORMATION**

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