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):

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HuaQi Livestock Farms Methane Engineering Programme of Activities

Version: 02

Date: 11/10/2012

The version history of the PoA-DD is summarized as below：

Version Number	Date	Description and reason of revision
01	23/04/2012	Completed date for GSP version of PoA-DD
02	11/10/2012	Revised version based on DOE's Validation

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

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1. General operating and implementing framework of the PoA

HuaQi Environmental Clean Technologies Co., Ltd. (hereinafter referred to as HECT), which is the coordinating/management entity (hereinafter referred to as the CME), have planned to implement a Programme of activities in Hunan, Henan and Guangxi Province, i.e. HuaQi Livestock Farms Methane Engineering Programme of Activities (hereinafter referred to as the PoA).

Hunan, Henan and Guangxi Province are the main animal breeding regions in China. There are thousands of animal farms operations in the three provinces. The common practice to treat animal manure in the three provinces is left to decay anaerobically in open lagoons, from which a large amount of methane would be emitted directly to the atmosphere. This is also the baseline scenario of the PoA.

The methane content is about 60% of the biogas, which is generated from open lagoons. It would be a kind of renewable energy could be utilized. Due to investment barriers and other reasons, little investment was attracted in these areas. HECT focus on clean technology investment and has successful investment on CDM projects. From 2011 HECT intends to implement biogas utilization POA on animal manure treat and management sector in Hunan, Henan and Guangxi Provinces. The investment strategy is based on CDM revenue and contributes to sustainable development.

The CME is responsible for CDM capacity building to CPA implementer, and keeps in touch with the related agencies (including DNA, DOE, EB and etc.) for CDM development process, tracking the PoA and each CPA under the PoA, supervising the implementation of the construction and monitoring plan to make sure the data's integrity and accuracy, and taking charge of the issues related CERs issuing activity.

Each CPA implementer will be responsible for planning, financing arrangement and the detailed implementation of the construction assigned to a construction company and monitoring plan of the project under the supervision of the CME.

2. Policy/measure or stated goal of the PoA

The PoA aims at installing animal manure treatment systems with biogas recovery system and then to utilize the biogas as energy across Hunan, Henan and Guangxi Province.

Project activities under the PoA include three scenarios. Each CPA falls into one of the following three scenarios can be eligible to include to the PoA:

Scenario I: The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use.

Scenario II: The biogas produced by the project is used for generating electricity for captive use that displaces electricity from national or a regional grid.

Scenario III: The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use and for generating electricity for captive use that displaces electricity from national or a regional grid.

In the absence of the PoA, the animal manure would be left to decay anaerobically in open anaerobic lagoons from which a large amount of methane would be emitted directly to the atmosphere, and equivalent thermal would be provided based on the fossil fuel, and/or the equivalent electricity generated by the biogas would be provided by the fossil fuel power plants connected to national or a regional grid. This is also the baseline scenario.

By recovery and utilization of biogas, the CPAs under the PoA can contribute to the reduction of greenhouse gases in 2 ways:

1) The biogas recovery system reduces methane emission into atmosphere;

2) The recovered biogas replaces conventional fossil fuels for energy generation, and therefore avoids CO_2 emissions from energy generation by the fossil fuel.

Because unlimited number of CPAs can be included in a PoA, it's hard to estimate the emission reductions of the PoA. By now, only the emission reduction of the first CPA (CPA-001) is calculated, which is 5,345tCO_2e per year and totally 37, 415tCO_2e during the first crediting period, details refer to the specific SSC-CPA-DD.

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

At Present, there is no mandatory law to enforce animal breeding entities to install animal manure treatment system with recovery of biogas and also no law to forbid fossil fuel-based energy used in China. Therefore, the CME confirms that the proposed PoA is a voluntary action.

4. Contribution to sustainable development by the PoA

By recovery and utilization of biogas, the PoA can contribute to the sustainable development in the following aspects:

Social and Economic benefits:

- The PoA will create employment opportunities from the construction and operation of the CPAs and for other related industries, such as manufacture industry of flow meters;
- Improving the air of livelihood will avoid respiratory diseases and cancer for women and children; also avoiding epidemic disease spread from animal to people because of innocuous treatment of dung.
- Promoting the development of animal raising industry, and furthermore increasing the tax revenues.

Environmental benefits:

- Improve the dung treatment system, avoid smoke in kitchens, which make the living environment in the region improving;
- Reduce GHG and pollutant emission by avoiding methane emission and replacing fossil fuel for energy generation.

A.3. Coordinating/managing entity and participants of SSC-PoA:

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Coordinating/managing entity and project participants of the PoA are listed as follows:

Name of Party(ies) involved (*) (host indicates a host Party)	Private and/or public entity(ies) ((CME) indicates the coordinating/managing entity) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (Host)	HuaQi Environmental Clean Technologies Co., Ltd.(CME)	Yes

(*) In accordance with the CDM modalities and procedures, at the time of making the PoA-DD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

The CME of the PoA as the entity is responsible to communicates with EB.

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

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A.4.1. Location of the programme of activities:

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A.4.1.1.Host Party(ies):

>>The People's Republic of China

A.4.1.2.Physical/ Geographical boundary:

>> The PoA is implemented in Hunan, Henan and Guangxi Province, so the boundary of the whole Hunan, Henan, and Guangxi Province administrative area delineates the boundary of the PoA. The geographic coordinate and administrative areas covered by the three provinces have been provided in Table A-1 and detailed physical location has been labelled in Figure A-1.

Table A-1 The Basic information for the three provinces

Provinces	Geographic coordinate range for each Province	Cities covered in each Province
Hunan Province	108°47′~114°15′E[1] 24°38′~30°08′N	14 Cities[2]: Changsha, Zhuzhou, Xiangtan, Hengyang, Yiyang, Changde, Yueyang, Shaoyang, Chenzhou, Loudi, Yongzhou, Huaihua, Zhangjiajie and Xiangxi Tujia and Miao Autonomous Prefecture.

[1] http://www.hnfgw.gov.cn/hndb/zrdl/Index.html

[2] http://www.hnfgw.gov.cn/hndb/hndbdz/Index.html

Henan Province	110°21'~116°39'E[3] 31°23'~36°22'N	18 Cities[4]: Zhengzhou, Kaifeng, Luoyang, Pingdingshan, Anyang, Hebi, Xinxiang, Jiaozuo, Puyang, Xuchang, Luohe, Sanmenxia, Nanyang, Qiushang, Xinyang, Zhoukou, Zhumadian, Jiyuan.
Guangxi	104°26'~112°04'E[5] 20°54'~26°24'N	14 Cities[6]: Guilin, Hezhou, Wuzhou, Yulin, Guigang, Laibin, Liuzhou, Hechi, Nanning, Qinzhou, Beihai, Fangchenggang, Chongzuo, Baise.

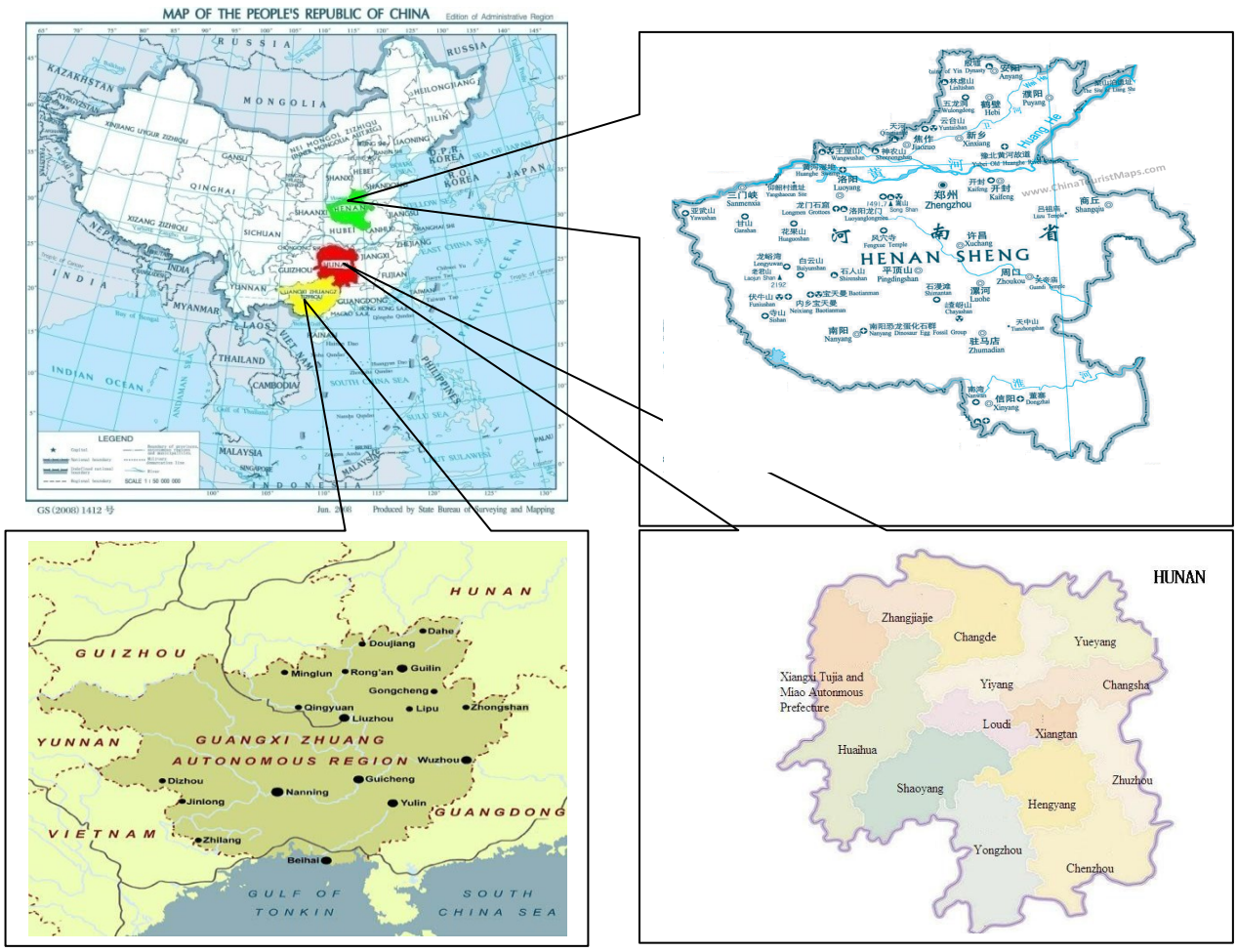

Figure A-1 Location of the provinces in the PoA

[3] http://www.henan.gov.cn/hngk/zrdl/

[4] http://www.henan.gov.cn/hngk/xzqh/

[5] http://lvyou.baidu.com/scene/view/de5f301a4dadc1b44664c8f3

[6] http://www.gxzf.gov.cn/zjgx/

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

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

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The technology employed in the CPAs includes manure treatment system, biogas recovery system and biogas utilization system.

1. Manure treatment system

The excrement from livestock farms will firstly enter into adjusting tank, and then enter into anaerobic reactor where anaerobic digestion takes place to convert organic matter included in manure into biogas. The anaerobic digestion can be simplified as the following:

Phase I – Hydrolysis – In this stage, bacteria release extra cellular enzymes that promote the compound's hydrolysis, generating small soluble molecules such as organic volatile acids. The products of this stage are the substrate for bacteria in the next step.

Phase II – Acidogenesis – The decomposed matter from the previous step is converted into organic acids. Other substances are formed: salts, carbon dioxide, water and ammonia.

Phase III – Methanogenesis – Methanogenic bacteria use hydrogen and carbon dioxide and transform it into methane, producing the biogas.

2. Biogas recovery and utilization system

The recovered biogas from anaerobic reactor will be led into desulphurization and dehydration facilities to purify the gas and extract harmful substances, and then the biogas will be utilized for thermal energy generation and/or electricity energy generation. The slurry and residue from the reactor will be used for soil application.

The technology details are shown in the following figure:

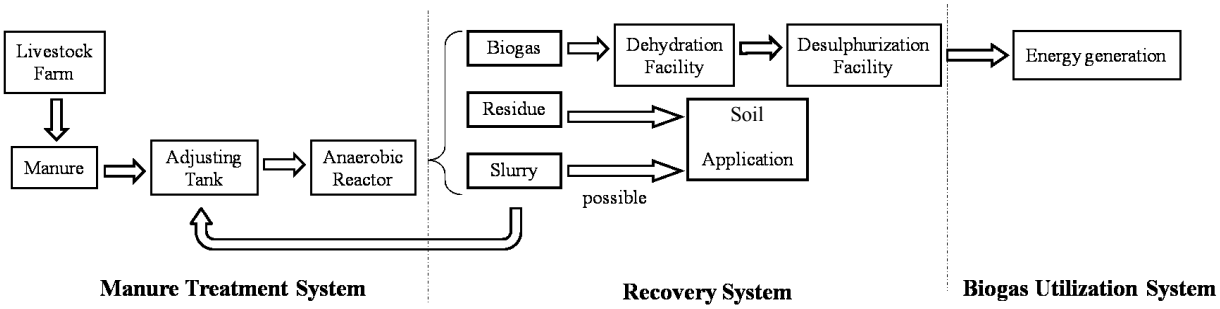

Figure A-2 Technology adopted in the PoA

In the absence of the PoA, the animal manure would be left to decay anaerobically in open anaerobic lagoons from which a large amount of methane would be emitted directly to the atmosphere, and equivalent thermal would be generated by fossil fuel, and/or equivalent electricity would be sourced from Central China Power Grid (CCPG) or China Southern Power Grid (CSPG) which predominated by fossil fuel-fired power plants. This is also the baseline scenario.

By recovery and utilization of biogas, the CPAs under the PoA can contribute to the reduction of greenhouse gases in 2 ways:

1) The biogas recovery system reduces methane emission into atmosphere;

2) The recovered biogas replaces conventional fossil fuels for energy generation, and therefore avoids CO_2 emissions from energy generation by the fossil fuel.

The PoA does not require any technology transferred from Annex-I countries to the host country.

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

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The CME have the competencies to check the features of potential CPAs and ensure that all the enrolled CPAs will be satisfied all the following eligibility criteria before inclusion in the PoA:

No.	Eligibility criteria description	Evidence Example[7]
1	Ref: EB 65, Annex 3 Para.14 (a): A CPA should be located in the boundary of the PoA, i.e. within Hunan, Henan or Guangxi Province.	-Feasibility Study Report (FSR) or equivalent. - Geographical co-ordinates of the specific CPA.
2	Ref: EB 65, Annex 3 Para.14 (b): (i) Measures should be taken to avoid double counting of emission reductions for the CPAs, like unique identifications of each CPA and livestock farm; (ii) The potential individual CPA implementer includes in the proposed PoA should sign a contract with the CME to confirm that: • They are aware of and have agreed that their activity is being subscribed to the PoA. • They have neither already been registered as a CDM project, nor as a CPA of another PoA.	-Unique geographical co-ordinates. - Confirmation letter from the CPA Implementer and CME for confirming that the project is not registered or in the process of being registered as a individual CDM project, nor as a part of any other PoA. - Cooperation contract between CME and CPA implementer - Confirmation check by reviewing the website of the UNFCCC/Chinese DNA by the CME.
3	Ref: EB 65, Annex 3 Para.14 (c): All activities under a CPA are to install anaerobic manure management systems in livestock farms to achieve methane recovery, and the recovered biogas will be utilized for thermal and/or electricity energy generation.	- FSR or equivalent. -FSR Approval or equivalent - If available, purchase contract/order of equipment.
4	Ref: EB 65, Annex 3 Para.14 (d): The start date of the CPA is "the earliest date at which either the implementation or construction or real action of a project activity begins", and it cannot be prior to the commencement of validation (GSP date 28/04/2012) of the programme of activities.	- If available, purchase contract/order of equipments or the construction/installation contract. - Be checked during physical site visit if the project construction has not started yet.
5	Ref: EB 65, Annex 3 Para.14 (e): The CPA shall meet all the applicability of the methodology	As defined in the criteria from No. 14 to 22 of this eligibility

[7] Because of the complexity of CPA situation, it's difficult and inadequacy to present all exact evidences at the PoA level. Therefore, only the evidence example(s) are presented, the actual evidences will be provided based on specific CPA situation.

	AMS-III.D (version 18.0), and the combined methodologies AMS-I.C (version 19.0) and/or AMS-I.F (version 2.0).	criteria description.
6	Ref: EB 65, Annex 3 Para.14 (f): The additionality for each CPA can be demonstrated by any one of the following approaches: **Approach 1:** Demonstrating additionality according to "Guidelines for Demonstrating Additonality of Microscale Project Activities" (Version 04.0). In case of Approach 1, the projects included in the CPA should meet relevant requirements in "Guidelines for demonstrating additionality of microscale project activities" (Version 04.0), including: ● The total installed capacity for type I (both electrical units and thermal units) of the CPA is no more than $15MW_{ther}$[8]; ● The emission reductions from type III components of the CPA are no more than 20 $ktCO_2e$ per year; ● The geographic location of the project activity is in a special underdeveloped zone (SUZ) of the host country. OR **Approach 2:** Demonstrating addtionality according to "Guidelines on the demonstration of additionality of small-scale project activities"(Version 09.0). In case of Approach 2, the additionality for each CPA can be demonstrated by any one of the following options: **Option 1**: The CPA can meet the following criteria in the positive list of technologies and project activity types: • The CPA as a whole meets the threshold criteria of a small scale CDM project activity; and • The CPA is solely composed of isolated unites where the users of the technology/measure are households or communities or Small and Medium enterprises (SMEs); and • The installed capacity of each isolated unit from type I component is no more than 2,250 kW_{ther} and the emission reductions of each isolated unit from type III component of each isolated unit is no more than 3,000tCO_2e per year. OR **Option 2:** The financial/economic indicator (such as IRR, NPV) of the projects without CER revenues included in the CPA should be worse than the selected benchmark, which is indicated in investment decision document (such as FSR).	- FSR or equivalent. - FSR Approval or equivalent. - ER calculation spreadsheet. -IRR/NPV calculation spreadsheet. - Specific CPA-DD.
7	Ref: EB 65, Annex 3 Para.14 (g):	- Questionnaires of the

[8] According to paragraph 8(b) of the guidelines for demonstrating additionality of microscale project activities, the definitions provided for output capacity and guidelines to SSC CDM methodologies (Version 17 or its update) shall be used. In the referenced paragraph, a conversion factor of 3 is used. Therefore, this conversion factor is consequently also applied to convert electrical capacity to the thermal capacity.

	Local stakeholder consultations and the environmental impact analysis would be done at the CPA level.	stakeholder consultation. - Environmental Impact Analysis Report (EIA) and its approval.
8	Ref: EB 65, Annex 3 Para.14 (h): CPA should not result into any funding from Annex I parties and the diversion of official development assistance.	- Declaration from the CPA Implementer.
9	Ref: EB 65, Annex 3 Para.14 (i): The recovered biogas will be combusted by biogas boilers to generate heat/steam and/or combusted by generator to generate electricity for livestock farms captive use, and/or supplied to households by gas pipelines.	- FSR or equivalent. - FSR Approval or equivalent
10	Ref: EB 65, Annex 3 Para.14 (j): No sampling method is involved in the PoA.	- Specific CPA-DD.
11	Ref: EB 65, Annex 3 Para.14 (k): The emission reductions from type III components of the CPA should be less than or equal to 60ktCO_2/yr and the total installed energy generation capacity of type I components of the CPA should be up to 15MW_{ele} (or 45 MW_{ther}).	- FSR or equivalent. - FSR Approval or equivalent. - ER calculation spreadsheet. - If available, purchase contract/order of equipment.
12	Ref: EB 65, Annex 3 Para.14 (l): The CME and implementers confirm that the proposed small-scale CPA is not a de-bundled component of a large scale activity[9]. The proposed small-scale CPA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below: (a)Has the same activity implementer as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology measure, and; (b)The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.	- Confirmation letter from CME and the CPA implementer. - If applicable, project list of same activity implementer as CPA implementer, applying the same technology/measure. - If applicable, list of CPAs of all PoAs with the same coordinating and managing entity applying the same technology/measure. - Geographical co-ordinates of above projects near to the implemented CPA.
13	The crediting period of the CPA shall not exceed the length of the PoA (28 years) regardless of the time of inclusion of CPA in the PoA.	- Specific CPA-DD.
The CPA shall meet the applicability criteria of the methodology AMS-III.D (Version 18.0) as elaborated below:		
14	The project activity under each CPA shall satisfy the following conditions:	
14.1	The animal population in the farms included in each CPA under the PoA should be managed under confined conditions;	- FSR or equivalent. - Physical site check.
14.2	Manure or the streams obtained after treatment are not discharged into natural water resources;	- FSR or equivalent. - Physical site check.
14.3	The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	-Meteorological data from local weather bureau or official

[9] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity.

		statistics website
14.4	In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m;	- FSR or equivalent. - Physical site check.
14.5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	- FSR or equivalent. - Physical site check.
15	The project activity satisfies the following conditions:	
15.1	The residual waste from the animal manure management system shall be handled aerobically;	- FSR or equivalent. .
15.2	Technical measures will be used to ensure that all biogas produced by the digester is used or flared;	- FSR or equivalent.
15.3	The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. Or if the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	- FSR or equivalent. - Physical site check.
16	Projects that recover methane from landfills shall use AMS-III.G "Landfill methane recovery" and projects for wastewater treatment shall use AMS-III.H. Project for composting of animal manure shall use AMS-III.F "Avoidance of methane emissions through composting". Project activities involving co-digestion of animal manure and other organic matters shall use the methodology AMS-III.AO "Methane recovery through controlled anaerobic digestion".	- FSR or equivalent. - FSR or equivalent. -Physical site check.
17	The recovered biogas from each CPA would be utilized by the animal farms as thermal and/or electrical energy generation, which can meet the option (a) as detailed in paragraph 3 of AMS-III.H.	-FSR or equivalent.
18	New facilities (Greenfield Projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the “General Guidelines to SSC CDM methodologies”.	-FSR or equivalent.
19	The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the “General Guidelines to SSC CDM methodologies”.	-FSR or equivalent.
For a specific CPA, it will be also satisfying one of the followed three scenarios with special project type:		
20	Scenario I: The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use.	The CPA under scenario I will be also satisfying the relevant applicability conditions of Methodology AMS-I.C (Ver.19.0).
20.1	The CPA will utilize the renewable biogas displacing fossil fuel to provide thermal energy	-FSR or equivalent - Specific CPA-DD.
20.2	New facilities (Greenfield Projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM	- FSR or equivalent. - Coal purchase invoices

	methodologies";	
20.3	If electricity and/or steam/heat produced by the CPA is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures there is no double-counting of emission reductions.	- FSR or equivalent. - Biogas Supply Agreement.
21	Scenario II：The biogas produced by the project is used for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario II will be also satisfying the applicability of Methodology AMS-I.F (Ver.2.0).
21.1	The project activity involved in the CPA is to use the renewable biogas for captive electricity use to displace electricity from regional grid CCPG or CSPG.	- FSR or equivalent. - Electricity purchase invoices
21.2	Project activities or project activity components supplying electricity to a grid shall apply AMS-I.D. Project activities for standalone off-the-grid power systems supplying electricity to households/users included in the boundary are eligible under AMS-I.A;	- FSR or equivalent. - Specific CPA-DD.
21.3	The project activity involved in the CPA will install new sets of electricity generation units at a site where there was no renewable energy power plant operating prior to the implementation of the project activity.	- FSR or equivalent. - Physical site check.
22	Scenario III: The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use and for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario III will be also satisfying the relevant applicability conditions of Methodology AMS-I.C (Ver.19.0) and AMS-I.F (Ver.2.0). As defined in the criteria from No. 20 to 21 of this eligibility criteria description.

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) :

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The following shall be demonstrated here:

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

At present, there is no mandatory law to enforce animal raising entities to install animal manure treatment system with biogas recovery or to forbid energy generation (for thermal or electricity) based on fossil fuel utilization in China. Therefore, the proposed PoA is a voluntary coordinated action of the CME.

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

A. The CME have planned to implement the PoA all over Hunan, Henan, and Guangxi Province, as the CME has no other income except CERs in the coordinating process, the proposed PoA would not be implemented if it can't be registered successfully as a PoA.

B. Each CPA included into the PoA would satisfy at least one approach of the assessment and demonstration of additionality (details please see Section E.5.1), otherwise, it won't be included into the PoA.

It is therefore decided that the PoA is implementing a voluntary coordinated action, and 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;

Not applicable as there is no mandatory law to enforce animal breeding entities to install animal manure treatment system with biogas recovery currently in China.

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

Not applicable as above.

Therefore, the anthropogenic emissions of GHG by sources reduced by CPAs under the PoA would not have occurred in the absence of the registered PoA, so the PoA is additional.

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

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A.4.4.1. Operational and management plan:

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The CME will be in full charge of the management of the whole PoA, and CPA implementers will be responsible for the operation of each CPA. And the main responsibilities of CME and CPA implementers can be elaborated as follows:

Entity	Management Responsibilities
CME	• Select and contract CPA implementers; • Track the PoA and the CPAs included and keep in touch with EB, Chinese DNA and related agencies; • Technical review of inclusion of CPAs; • Develop a PoA management system and making continuous improvements of the system; • Maintain existing relationship with the CPA implementers (e.g. conduct training for data monitoring); • Supervise the monitoring implementation of each CPA, and make sure the implementation of the CPA, and periodically collect monitoring data and make sure the data's integrity and accuracy; • Prepare monitoring reports for emission reduction verification.
CPA implementer	• Implement the CPA project activity (construction, daily operation, and maintenance of the project); • Carry out the monitoring action in accordance with monitoring plan under the guidance of the CME; • Collect the initial information and prepare the monitoring data to CME.

The operational and management plan established by the CME for the implementation of the PoA is presented as following:

(i) A record keeping system for each CPA under the PoA

Each CPA is operated under the control of the CME. Each CPA has its exclusive number, and each livestock farm under the CPA has a unique number as well. The CME will establish a database for records of each livestock farms under of the CPAs included in the PoA. The CME will record and document the following CPA detail information in the database:

- Number and address of the CPAs
- Number, name and address of the livestock farms under the CPAs
- Number, name and address of households who gain the biogas from the CPAs
- The name and contact details of each participating CPA implementer
- The geographical coordinates of each CPA (for example, GPS coordinates)
- The record of technical specification of each CPA
- Monitoring parameters of each CPA.

The database will be kept as electronic versions in the office of the CME and backed up regularly. All data acquired within this data recording system will be kept at least until two years after the end of the crediting period.

In this way, the CME will be able to track the emission reduction of each CPA over the full duration of the crediting period.

The CDM monitoring team of the CPA implementer will keep a record of the monitoring data, monthly aggregate and summarize as electronic edition and deliver to the CME's database system. The monitoring team of each CPA including a team leader, an assistant, and at least two operators, will be designated by the CPA implementer. The operation of each system is performed by the team leader (e.g. the livestock farm owner) with the help of the assistant; the operators are responsible for calibrating and maintaining the meters, measuring and recording relevant readings, collecting, checking, archiving and managing data, and making summary; training of the operation and management is given by technicians and professors invited by the HECT, the CME, who is also responsible for registration and issuance of the PoA.

The operation and management plan and recording keeping system developed is described as follows.

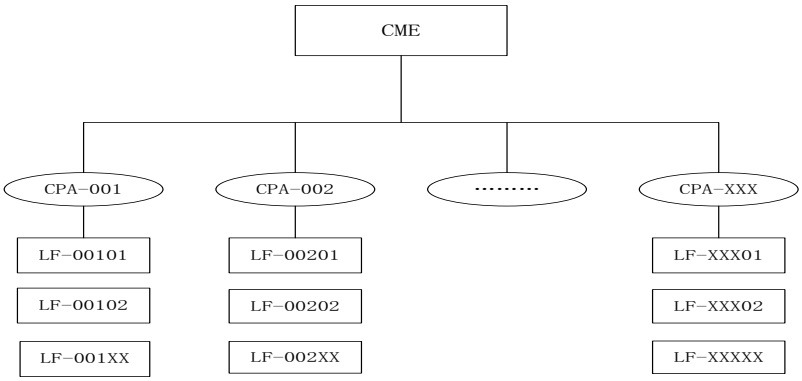

Figure A-3 Record keeping system of the PoA

The CME will be responsible for the management of records and data associated with each CPA. The electronic database will be updated. Hard copy documentation such as paper maps, diagrams and

environmental assessment will be collected in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed and sent to the monitoring computer managed by the CME at a regular basis. All the data should be saved up to 2 years after the end of the crediting period.

(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

As demonstrated above, all animal manure treatment units registered in one CPA will be uniquely defined and recorded, thus each CPA is uniquely identified. In addition, the CME will compare every new CPA to the already existing records and the list of the project activities under-validation, requesting for registration or registered at the UNFCCC to ensure that any animal manure treatment unit in a new CPA has neither already been registered as a CDM project, nor as a CPA of another PoA. Furthermore, confirmation letters from the CME and the CPA implementer(s) and cooperation contract between CPA implementer and CME will be provide to confirm that: a) they are aware of and have agreed that their activity is being subscribed to the PoA. b) they have neither already been registered as a CDM project, nor as a CPA of another 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 Debundling for SSC Project Activities (Ver. 03.0) issued on 54th meeting, projects with a size greater than 1% the small-scale thresholds defined by the methodology applied[10], will perform the de-bundling check. The CME and the livestock farm owners confirm that, each CPA included into the PoA is not a de-bundled component of a large scale activity if there is already an activity[11], which has the same activity implementer as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and the boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

Also, the database described above will be used to perform the de-bundling check. Every new CPA will be compared to the already existing database of PoA and the list of project activities under-validation, requesting for registration or registered at the UNFCCC, IGES database and CDM pipeline[12]. Moreover as shown in subsection (iv) below, the project implementers will be made aware of the de-bundling rules and will certify that the proposed CPA is not a de-bundled part of another CDM programme activity (CPA) or CDM project activity.

Furthermore, if a proposed CPA is a de-bundled component of another CDM programme activity (CPA) or CDM project activity, it won't be included into the PoA.

(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

Cooperation contracts will be signed between the CME and the owner in each CPA before inclusion of the CPA in the PoA. This is to ensure that all entities involved in the CPA operation agree that their activities are being subscribed to the PoA. In addition, if those entities involved in a proposed CPA, don't

[10] i.e., 15 kW installed capacity or 0.6 GWh annual energy savings or o.6 ktCO2e annual emission reductions

[11] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity.

[12] IGES database please refer to: http://www.iges.or.jp/en/cdm/report.html

CDM pipeline please refer to: http://cd4cdm.org/CDMJIpipeline.htm

agree their activities being subscribed to the PoA, the entities will be excluded from the proposed CPA or the CPA won't be included in the PoA.

A.4.4.2. Monitoring plan:

>>

Each CPA will install the required monitoring equipments from applied methodologies and no sampling will be conducted for calculating the emission reductions attributable to each project.

Relevant parameters will be monitored according to AMS-III.D (Ver.18.0), AMS-I.C (Ver.19.0), AMS-I.F (Ver.2.0) and the related methodologies/tools/guidance/standards.

For each CPA, all parameters included in section E.7.1. will be monitored according to the operation and monitoring manual.

- CPA implementer will monitor and record all parameters included in section E.7.1. individually.
- HECT will provide guidance to CPA implementer on how monitoring should be conducted and data should be collected in regards to emission reduction calculation.
- CPA implementer will provide data on monitored parameters to HECT.
- HECT will document and store all parameters included in section E.7.1. provided by CPA implementer in the database. Besides, copy of the data provided by CPA implementer will be kept at the CME office.

To guarantee the uncomplicated access to the CPA data, the CME will maintain a database for all included CPAs, for example, each CPA is uniquely identified based on the operation and management plan established by the CME(details refer to Figure A-3 of A.4.4.1), to guarantee as well the system transparency and avoid the double accounting.

In order to implement the monitoring plan effectively, the specific person in charge of the PoA is designated by the CME to make sure the implementation of monitoring plan and keep in touch with EB, DNA and other relevant parties. And the structure of the monitoring team of each CPA is clearly shown in Section E.7.2. (details refer to Figure E-2 of E.7.2) .

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

>>

There is no public funding from Annex I parties for the PoA.

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

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

>>28/04/2012 (the date on which the CDM-PoA-DD is first published for global stakeholder consultation.)

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:

>>

Environmental Analysis is done at PoA level ☐
Environmental Analysis is done at SSC-CPA level ☑

Each CPA under the PoA is totally independent and the livestock farms in the CPA are needed to implement environmental analysis respectively and in case that each livestock farm under a CPA has implemented its environmental analysis, then as a result, the environmental analysis can satisfy the requirements of the local laws and regulations.

Therefore, the environmental analysis should be done at SSC-CPA level.

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

>>

The environmental analysis for each project farm included in CPA will be described and reflected in the specific CPA-DD.

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):

>>

The EIA will be approved by local environmental protection bureau at CPA level in accordance with the China laws/regulations.

SECTION D Stakeholders' comments

>>

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

>>

Local stakeholder consultation is done at PoA level ☐
Local stakeholder consultation is done at SSC-CPA level ☑

In order to ensure full participation and consultation of local stakeholders of each CPA, the proposed Programme of Activities intends to undertake the local stakeholder consultation at CPA level.

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

>>

Local stakeholders will be invited for each livestock farm involved in the SSC-CPA to participate in a stakeholder meeting or a questionnaire survey launched by CPA implementer, and the feedback will be solicited with the comments considered in the design and implementation of each project. These will be documented in each specific CPA-DD.

D.3.Summary of the comments received:

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The comments received for the corresponding CPA will be documented in each specific CPA-DD.

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

>>

Clarifications following comments received on the corresponding CPA will be documented in each specific CPA-DD.

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:

—AMS-III.D:"Methane recovery in animal manure management systems" (Ver.18.0)

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

http://cdm.unfccc.int/methodologies/DB/0IB37O8ROJ5JRJXIUWQAJRCDUFKJP2

—AMS-I.C: "Thermal energy for the user with or without electricity" (Ver.19.0)

http://cdm.unfccc.int/methodologies/DB/6EL4AG49US2S1DNH55Y4S7GDQFA2JF

— AMS-I.F: "Renewable electricity generation for captive use and mini-grid" (Ver.2.0)

http://cdm.unfccc.int/methodologies/DB/9V3T8W0N5PMCJH4YVEA04YYFTVHP3Q

Those methodologies also refer to:

—Tool to calculate the emission factor for an electricity system (Ver.02.2.1)

—Guidelines on the demonstration of additionality of small-scale project activities (Ver.09.0)

—Guidelines for demonstrating additonality of micro scale project activities (Ver. 04.0)

—Tool for the demonstration and assessment of additionality (Ver.06.0.0)

For more information, please refer to:

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

As per methodologies above, each of them is approved for use in a PoA. And according to paragraph 11(c) of "*General Guidelines to SSC CDM Methodologies*" (Ver. 17.0, EB 61, Annex 21), the combination of approved methodologies of AMS-III.D, AMS-I.C and AMS-I.F could be applied to a PoA without further assessment of cross effects. And according to paragraph 29(c) of EB 65, Annex 3, "A principle technology/measure is applied consistently in each CPA using multiple combinations of methodologies.", the principle technology/measure of the PoA is anaerobic manure management systems with different ways of utilizing recovered biogas (scenario I for thermal generation, scenario II for electricity generator, and scenario III for both), therefore multiple combinations of methodologies applied in the PoA are eligible.

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

>>

For a specific CPA under the PoA, it shall meet the applicability criteria of different methodologies combination of AMS-III.D (Ver.18.0), AMS-I.C(Ver.19.0) and AMS-I.F(Ver.2.0), according to the Scenario I, II and III as described in Section A.4.2.2.

For all the CPAs under the PoA, the details analysis on the applicability criteria of methodology AMS-III.D (Ver.18.0) is as the following table:

No.	Applicability Conditions as per AMS-III.D (Ver.18.0)	Situation of a CPA under the PoA
1	The livestock population in the farm is managed under confined conditions;	The farms involved in each CPA are managed under confined conditions.
2	The manure or streams obtained after treatment are not	Manure/streams obtained after

	discharged into natural water resources (e.g. river or estuaries), otherwise AMS-III.H "Methane recovery in wastewater treatment" shall be applied;	treatment of the CPA under the PoA are not discharged into natural water resources;
3	The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The annual average temperature of Hunan, Henan and Guangxi Province is 15~22°C[13], higher than 5°C. Specific temperature please refer to CPA-DD.As per eligibility criteria 14.3 for inclusion of a CPA in the PoA in Section A.4.2.2, it can be met;
4	In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m;	As per eligibility criteria 14.4 for inclusion of a CPA in the PoA in Section A.4.2.2, the manure waste is left to decay in the open lagoon, the retention time of manure waste is greater than 1 month and the depths of the lagoon is at least 1m. It can be met;
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario;	As per eligibility criteria 14.5 for inclusion of a CPA in the PoA in Section A.4.2.2, all the methane was discharged into the atmosphere in the baseline scenario. It can be met;
6	The residual waste from the animal manure management system[14] shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of AMS-III.AO "Methane recovery through controlled anaerobic digestion". In case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured;	The residual waste from the animal manure management system will be applied to soil after proper treatment in the livestock farm; details please refer to Section B.2. of specific CPA-DD. As per eligibility criteria 15.1 for inclusion of a CPA in the PoA in Section A.4.2.2, it can be met;
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	All biogas produced by the digester will be used for energy generation through biogas boiler and/or stoves and/or electricity generator, and flared if necessary. And the gas tank will temporarily store the biogas in case emergency. As per eligibility criteria 15.2 for inclusion of a CPA in the PoA in Section A.4.2.2, it can be met;
8	The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic	As per eligibility criteria 15.3 for inclusion of a CPA in the PoA in Section A.4.2.2, the storage time of the manure

[13] http://www.hntj.gov.cn/sjfb/tjnj/07tjnj/img/;
http://www.gxtj.gov.cn/show.asp?typid=212&id=7710;
http://www.ha.stats.gov.cn/hntj/hnsq/A0601index_1.htm;

[14] Animal manure management system includes manure treatment system, biogas recovery system and biogas utilization system.

	digester. Or if the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	after removal from the animal barns, including transportation, will not exceed 45 days. It can be met;
9	Projects that recover methane from landfills shall use AMS-III.G "Landfill methane recovery" and projects for wastewater treatment shall use AMS-III.H. Project for composting of animal manure shall use AMS-III.F "Avoidance of methane emissions through composting". Project activities involving co-digestion of animal manure and other organic matters shall use the methodology AMS-III.AO "Methane recovery through controlled anaerobic digestion";	As per eligibility criteria 16 for inclusion of a CPA in the PoA in Section A.4.2.2, each CPA under the PoA will introduce anaerobic manure treatments with biogas recovery to treat only animal manure. It can be met;
10	Different options to utilize the recovered biogas as detailed in paragraph 3 of AMS-III.H are also eligible for use under this methodology. The respective procedures in AMS-III.H shall be followed in this regard;	As per eligibility criteria 17 for inclusion of a CPA in the PoA in Section A.4.2.2, the recovered biogas will be utilized for thermal and/or electricity energy generation directly, which can meet the option (a) of paragraph 3 in AMS-III.H;
11	New facilities (Greenfield Projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies";	As per eligibility criteria 18 for inclusion of a CPA in the PoA in Section A.4.2.2., if CPAs under the PoA are Greenfield Projects or project activities involving capacity additions, they can meet the related and relevant requirements in the "General guidelines to SSC CDM methodologies";
12	The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General guidelines to SSC CDM methodologies";	As per eligibility criteria 19 for inclusion of a CPA in the PoA in Section A.4.2.2, if replacement of equipment is involved in a CPA under the PoA, demonstration of the remaining lifetime of the replaced equipment will be met as described in the "General guidelines to SSC CDM methodologies";
13	Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity;	As per eligibility criteria 11 for inclusion of a CPA in the PoA in Section A.4.2.2, the emission reduction from Type III components of each CPA under this PoA is less than or equal to 60 kt CO_2e per year.

For the CPAs under Scenario I and III described in eligibility criteria of clause 20 and 22 in section A.4.2.2, the details analysis on the applicability criteria of methodology AMS-I.C (Ver.19.0) is shown in the following table:

No.	Applicability Conditions as per AMS-I.C (Ver.19.0)	Situation of the CPA

1	This category comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel;	As per eligibility criteria 20.1 for inclusion of a CPA in the PoA in Section A.4.2.2, each CPA will utilize biogas displacing fossil fuel to provide thermal and/or energy;
2	Biomass-based co-generating systems that produce heat and electricity are included in this category. For the purpose of this methodology "Cogeneration" shall mean the simultaneous generation of thermal energy and electrical and/or mechanical energy in one process. Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (a) Electricity to a grid; (b) Electricity and/or thermal energy (steam or heat) for on-site consumption or for consumption by other facilities; (c) Combination of (a) and (b);	Not applicable. Because no co-generating systems are involved in each CPA;
3	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW_{ther};	As per eligibility criteria 11 for inclusion of a CPA in the PoA in Section A.4.2.2, the total installed/rated energy generation capacity of each CPA is no more than 45 MW_{ther};
4	For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel shall not exceed 45 MW thermal;	Not applicable. Because each CPA does not involve in co-fired systems;
5	In the case of project that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should be equal to or less than 45 MW_{ther} and should be physically distinct from the existing units;	Not applicable. All the CPAs do not involve in the addition of renewable energy units at an existing renewable energy facility;
6	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category;	Not applicable. All CPAs under the PoA is not seeking to retrofit or modify an existing facility for renewable energy generation;
7	New facilities (Greenfield Projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies";	As per eligibility criteria 20.2 for inclusion of a CPA in the PoA in Section A.4.2.2., if CPAs under the PoA are Greenfield Project or project activities involving capacity additions, they can meet the related and relevant requirements in the "General guidelines to SSC CDM methodologies";
8	If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation;	Not applicable. Because no solid biomass fuel is used in each CPA;

9	If electricity and/or steam/heat produced by the CPA is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures there is no double-counting of emission reductions;	As per eligibility criteria 20.3 for inclusion of a CPA in the PoA in Section A.4.2.2., if electricity and/or steam/heat produced by the CPA is delivered to a third part, a contract between the supplier and consumer(s) of the energy will be entered to ensure that there is no double-counting of emission reductions.
10	If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis, any incremental emissions occurring due to the implementation of the project activity shall be taken into account either as project or leakage emissions;	Not applicable. Because the project activity does not apply this methodology on a stand alone basis, and it is combined with the AMS-III.D (Ver.18.0), a type III component of a SSC methodology.
11	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources.	Not applicable. Because each CPA does not involve charcoal based biomass energy generation.

For the CPAs under Scenario II and III described in eligibility criteria of clause 21 and 22 in section A.4.2.2, the details analysis on the applicability criteria of methodology AMS-I.F (Ver.2.0) is shown in the following table:

No.	Applicability Conditions as per AMS-I.F(Ver.2.0)	Situation of the CPA
1	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant; (c) A carbon intensive mini-grid.	As per eligibility criteria 21.1 for inclusion of a CPA in the PoA in Section A.4.2.2.,the project activity involved in each CPA is to use the renewable biogas for captive electricity use to displace electricity from regional grid CCPG or CSPG;
2	For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.	Not applicable. Because mini-grid is not involved in each CPA;
3	Project activities or project activity components supplying electricity to a grid shall apply AMS-I.D. Project activities for standalone off-the-grid power systems supplying electricity to households/users included in the boundary are eligible under AMS-I.A;	As per eligibility criteria 21.2 for inclusion of a CPA in the PoA in Section A.4.2.2., electricity generated from each CPA is for captive-use, but not supplied to the grid.

4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2;	Not applicable. Because each CPA does not involve hydro power plant;
5	For biomass power plants, no other biomass other than renewable biomass are to be used in the project plant.	Not applicable. For each CPA the biogas used is recovered from anaerobic manure treatments, which belongs to renewable biomass, and no other biomass will be used;
6	This methodology is applicable for project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition, (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	As per eligibility criteria 21.3for inclusion of a CPA in the PoA in Section A.4.2.2., for each CPA will install new sets of electricity generation units at a site where there was no renewable energy power plant operating prior to the implementation of the project activity.
7	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Not applicable. There is no existing renewable power generation facility for each CPA.
8	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW;	Not applicable. There is no existing renewable power generation facility for each CPA;
9	If the unit added has both renewable and nonrenewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW;	Not applicable. There is only renewable power generation unit will be installed for each CPA;
10	Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable. Because each CPA does not install combined heat and power system.

11	In case electricity produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the electricity will have to be entered into specifying that only the facility generating the electricity can claim emission reductions from the electricity displaced.	Not applicable. Because the electricity generated is for captive use for each CPA.

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

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As per applied methodologies, the boundary of the CPA includes the physical; geographical site(s) of the livestock, animal manure management systems, facilities which recover and flare/combust or use methane (AMS-III.D); industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity (AMS-I.C); and all power plants connected physically to the electricity system that the CDM project power plant is connected to (AMS-I.F).Emissions sources included in or excluded from the project boundary are shown in the following Table.

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the manure treatment processes	CH_4	Included	The major source of emissions in the baseline
		N_2O	Excluded	Excluded for simplification. This is conservative
		CO_2	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	CO_2	Included	The major source of emissions(This is suitable for a CPA under Scenario I and III described in eligibility criteria of clause 20 and 22 in section A4.2.2)
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from electricity energy generation	CO_2	Included	The major source of emissions (This is suitable for a CPA under Scenario II and III described in eligibility criteria of clause 21 and 22 in section A4.2.2)
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project activity	Emissions from physical leakage of biogas in the manure management systems	CH_4	Included	The major source of emissions
		CO_2	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Emissions from flaring or combustion of biogas	CO_2	Excluded	Excluded for simplification
		CH_4	In/Excluded	It may be a major source of emissions for some CPAs.
		N_2O	Excluded	Excluded for simplification
	Emissions from on-site electricity use and/or fossil	CO_2	Included	The major source of emissions
		CH_4	Excluded	Excluded for simplification

	fuel consumption	N_2O	Excluded	Excluded for simplification
	Emissions from the storage of manure before being fed into the anaerobic digester	CO_2	Excluded	Excluded for simplification.
		CH_4	In/Excluded	It may be a major source of emissions for some CPAs
		N_2O	Excluded	Excluded for simplification.
	Emissions from incremental transportation	CO_2	In/Excluded	It may be a major source of emissions for some CPAs.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

A general schematic view of the boundaries for each project under the PoA is shown in the figure below.

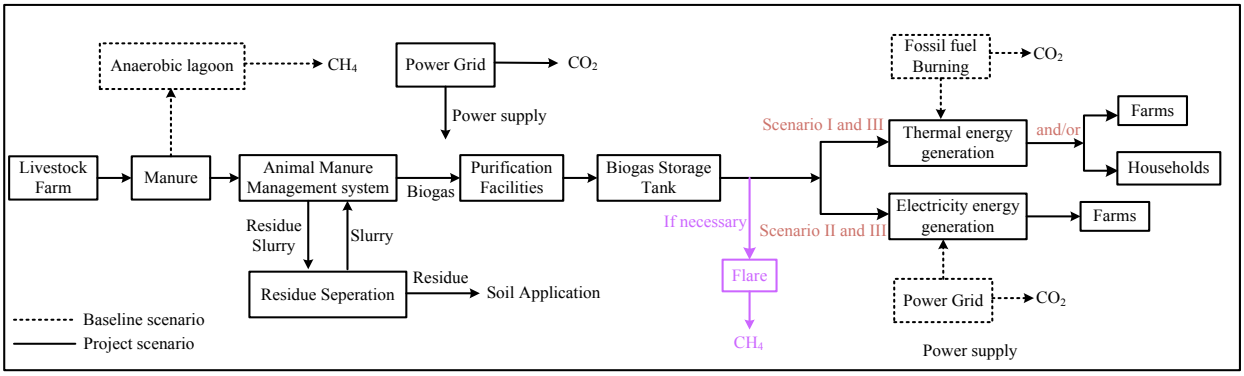

Figure E-1 Project boundary

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

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As per AMS-III.D (Ver.18.0), for animal manure management the baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere.

According to AMS-I.C (Ver.19.0), for renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission factor for the fossil fuel displaced.

According to AMS-I.F (Ver.2.0), the project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from a national or a regional grid.

Therefore, in project case, with the different methodologies combination of AMS-III.D (Ver.18.0), AMS-I.C (Ver.19.0) and AMS-I.F (Ver.2.0), the baseline scenario for a CPA can be concluded as:

Scenario	Methodologies combination	Baseline scenario
I	AMS-III.D + AMS-I.C	Animal manure is treated anaerobically without methane recovery and destruction, and the equivalent thermal energy is generated by fossil fuel;
II	AMS-III.D + AMS-I.F	Animal manure is treated anaerobically without methane recovery and destruction, and the equivalent electricity is supplied by CCPG or CSPG;

III	AMS-III.D+AMS-I.C+AMS-I.F	Animal manure is treated anaerobically without methane recovery and destruction, the equivalent thermal energy is generated by fossil fuel, and the equivalent electricity is supplied by CCPG or CSPG.

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):

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

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A specific SSC-CPA argues additionality based on "Guidelines for demonstrating additionality of microscale project activities"(Version 04.0) or the guidance provided by "Guidelines on the demonstration of additionality of small-scale project activities"(Version 09.0). The additionality of each CPA will be assessed according to the following steps:

Considering CDM before the construction of the CPA

To demonstrate the additionality of each CPA, the first step must be taken is to list the timeline of the main events involved in the implementation of each CPA, which will clearly prove that the project owner took CDM into serious consideration before commencing the CPA. According to the glossary of CDM terms, the starting date of a CDM programme activity is the earliest date at which either the implementation or construction or real action of a programme activity begins. The starting date of the CPA cannot be prior to the commencement of validation of the programme of activities, here means the date on which the CDM-PoA-DD is first published for global stakeholder consultation (GSP time).

Additionality demonstration of the CPA

Based on the capacity and location of a CPA under this SSC PoA, one of two following approaches for additionally demonstration will be used:

Approach 1: Demonstrating addtionality according to *Guidelines for Demonstrating Additonality of Microscale Project Activities, Version 04.0.*

The additionality criteria of "Microscale Project Activity" related to the CPA could be summarized as follow:

No.	Criteria in the guideline	Real situation of the CPA	Applicable? (Y/N)
1	The total installed capacity from type I component (both electrical units and thermal units) of the CPA is no more than $15MW_{ther}$[15];	The total installed capacity from type I component of the CPA is XXX MW;	
2	The emission reductions from type III component of the project is no more than 20 $ktCO_2e$ per year;	The emission reductions from type III component of the CPA is XXX tCO_2e per year;	

[15] According to paragraph 8(b) of the guidelines for demonstrating additionality of microscale project activities, the definitions provided for output capacity and general guidelines to SSC methodologies (version 17.0) shall be used. In the referenced paragraph, a conversion factor of 3 is used. Therefore, this conversion factor is consequently also applied to convert electrical capacity to the thermal capacity.

3	The geographic location of the project activity is in one of the Least Developed Countries or the Small Island Countries (LDCs/SIDs) or in a special underdeveloped zone (SUZ) of the host country;	The project activity/ies in the CPA is/are located in XX County, XX City of Hunan/ Henan/Guangxi Province, which is/isn't a special underdeveloped zone of the P.R. China[16];	

If the CPA under the PoA can satisfy all the above applicable criteria, it could be deemed as automatically additional.

Approach 2: Demonstrating addtionality according to "Guidelines on the demonstration of additionality of small-scale project activities"(Version 09.0).

The CPA is additional only if proved to be additional according to the either paragraph 2(c) or paragraph 1 (a) of "Guidelines on the demonstration of additionality of small-scale project activities", which is respectively demonstrated as Option 1 and Option 2 followed.

Option 1 Positive list

According to Guidelines on the demonstration of additionality of small-scale project activities paragraph 2 (c), the small scale project activities are defined as automatically additional if the project activities solely composed of isolated unites where the users of the technology/measure are households or communities or Small and Medium enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds. It can be summarized as follow in accordance with the CPA situation:

(i) The CPA as a whole meets the threshold criteria of a small scale CDM project activity;

(ii) The CPA is solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium enterprises (SMEs);

(iii) The installed capacity of each isolated unit from type I component is no more than 2,250 kW_{ther} and the emission reductions of each isolated unit from type III component of each isolated unit is no more than 3,000tCO_2e per year.

In conclusion, the CPA under the PoA can be deemed to be automatically additional if the three conditions of the above criteria can be meet.

<u>Option 2 Investment Barrier</u>

According to the Guidelines on the demonstration of additionality of small-scale CDM project activities paragraph 1 (a) , investment barrier analysis can be applied for each CPA under the PoA. The steps in the "Tool for the demonstration and assessment of additionality" (Ver.6.0.0) will be applied as follow:

Substep 1 Determine appropriate analysis method

The "Tool for the demonstration and assessment of additionality" (Ver.06.0.0) suggests three analysis methods which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

[16] The definition and condition of SUZ is demonstrated in paragraph 2 (a) of "Guidelines for demonstrating additionality of microscale project activities". The relevant requirements will be met if the approach 1 is chosen to demonstrate addtionality.

Since CPAs under the PoA will earn revenues not only from the CERs sales, the simple cost analysis method is not appropriate.

Investment comparison analysis method is only applicable to projects whose alternatives are similar inves tment projects. The continuation of the current situation is not an investment project; the investment comp arison analysis is not preferable.

CPAs will use benchmark analysis method (Option III) and demonstrate that it is not likely to be the most financially attractive option.

Substep 2 Option III. Apply benchmark analysis

The decision-making financial indicator (mainly IRR, NPV) will be used for investment analysis. Accordingly, the decision-making benchmark which is indicated in investment decision document (such as FSR) will be selected as the financial benchmark for the CPA.
The selected benchmark (or discount rate when NPV used as financial indicator) will be demonstrated to be compliance with the relevant rules indicated in the "Tool for the demonstration and assessment of additionality" (Ver.06.0.0).
On the basis of the above selected benchmark, calculation and comparison of financial indicators are carried out in substep3.

Substep 3 Calculation and comparison of financial indicators

As mentioned above, different indicators may be used in different cases. However, IRR will be used as a example indicator for demonstration in the following part.

The expected input parameters for IRR calculation is as following, which might be adjusted for the specific case:

Table E-1Generic Financial Parameters of the CPA

No.	Parameter	Value	Units	Source
1	Static total investment		10,000RMB	
1.1	Self-raised capital		10,000RMB	
2	Total biogas generation		10,000m^3/year	
3	Annual total revenue		10,000RMB/year	
4	Project lifetime (include construction period)		years	
5	Annual O&M cost		10,000 RMB	
6	Rate of VAT		%	
7	Rate of income tax		%	
8	Rate of city maintenance and construction tax		%	
9	Rate of education fee addition		%	

10	CERs price		RMB/tCO_2e	

Generally values that were applied at the moment of the investment decision shall be used for the analysis above. Mostly, the Feasibility Study Report(FSR) or Preliminary Design Report (PDR) will be widely used for investment decision in China.

The calculation results of the IRR with and without CDM compared to benchmark are presented as:

Livestock Farm No.	**IRR without CER revenue**	**IRR with CER revenue**

The tool states that: *If the CDM project activity has a less favorable indicator (e.g. lower FIRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.*

Therefore, this CPA is not considered financially attractive if the IRR without CER revenue is lower than X% (benchmark IRR).

Substep 4 Sensitivity analysis

According to "Guidance on the assessment of investment analysis", only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For each CPA, the following financial parameters are taken as uncertain factors for sensitivity analysis of financial attractiveness:

- Static total investment
- Annual total revenue
- Annual O&M cost

A sensitivity analysis should be carried out to estimate whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variation in the critical assumptions. An assessment is conducted assuming the above three indicators varied in the range of -10%-+10%.

Table E-2 Sensitivity analysis of the CPA

	-10%	-5%	0%	5%	10%
Static total investment					
Annual total revenue					
Annual O&M cost					

If the IRR of the CPA could not reach the benchmark even if the variation range of the factor reaches 10%, then the CPA is additional. If the IRR exceeds the benchmark in one or more of the above scenarios considered for the sensitivity analysis, evidences shall be provide that this is unlikely to happen.

Summary and conclusion

The investment analysis will be applied on each individual biogas project in a CPA for additionality demonstration. These criteria are translated into the criteria for assessing the additionality of a SSC-CPA as described below and the eligibility criteria as described in section A.4.2.2. By assessing these key factors for all new CPAs that will be included, the CME can assure that all CPAs included are additional and meet all requirements of all applied standards.

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

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The key criteria for assessing the additionality of a CPA would be either Approach 1 "Guidelines for demonstrating additionality of microscale project activities" (Ver.04.0) or Approach 2 "Guidelines on the demonstration of additionality of small-scale project activities"(Ver.09.0):

Approach 1: "Guidelines for demonstrating additionality of microscale project activities" (Ver.04.0)
1. The total installed capacity from type I component of the CPA is no more than 15MW_{ther}; and, 2. The emission reductions from type III component of the CPA is no more than 20 $ktCO_2e$ per year; and, 3. The geographic location of the projects in the CPA is in a special underdeveloped zone (SUZ) of the P.R. China.
Or,
Approach 2: "Guidelines on the demonstration of additionality of small-scale project activities"(Ver.09.0)
Option 1: The CPA can meet the following criteria in the positive list of technologies and project activity types:
• The CPA as a whole meets the threshold criteria of a small scale CDM project activity; and, • The CPA is solely composed of isolated unites where the users of the technology/measure are households or communities or Small and Medium enterprises (SMEs); and, • The installed capacity of each isolated unit from type I component is no more than 2,250 kW_{ther} and the emission reductions of each isolated unit from type III component of each isolated unit is no more than 3,000tCO_2e per year.
Or,
Option 2: The financial/economic indicator (such as IRR, NPV) of the projects without CER revenues included in the CPA should be worse than the selected benchmark, which is indicated in investment decision document (such as FSR).

E.6. Estimation of emission reductions of a CPA:

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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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The methodology combination for different CPA project scenarios in this PoA could be summarized as below:

Scenario No.	Description of project scenario on energy generation	Methodology Combination
Scenario I	The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use.	AMS-III.D (Ver.18.0) and AMS-I.C (Ver.19.0).
Scenario II	The biogas produced by the project is used for generating electricity for captive use that displaces electricity from national or a regional grid.	AMS-III.D (Ver.18.0) and AMS-I.F (Ver.2.0).
Scenario III	The biogas produced by the project is used for supplying users with thermal energy that displaces fossil fuel use and for generating electricity for captive use that displaces electricity from national or a regional grid.	AMS-III.D (Ver.18.0), AMS-I.C (Ver.19.0) and AMS-I.F (Ver.2.0).

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission

reductions of a SSC-CPA:

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According to methodologies mentioned above, the emission reductions calculation includes:

- Baseline emissions
- Project emissions
- Leakage emissions
- Emission reductions

I. Calculate baseline emissions

Baseline emissions of the project include baseline emissions from methane recovery $BE_{CH_4,Y}$ according to AMS-III.D (Ver.18.0) and/or CO_2 emissions from thermal energy generation $BE_{Thermal,y}$ according to AMS-I.C (Ver.19.0) and/or CO_2 emissions from power generation $BE_{El,y}$ according to AMS-I.F (Ver.2.0) in the absence of the CPA.

The baseline emission is calculated as follow:

$$\begin{cases} BE_y = BE_{CH_4,y} + BE_{Thermal,y} & \text{Only applicable to CPAs under Scenario I} \quad (1) \\ BE_y = BE_{CH_4,y} + BE_{El,y} & \text{Only applicable to CPAs under Scenario II} \quad (2) \\ BE_y = BE_{CH_4,y} + BE_{Thermal,y} + BE_{El,y} & \text{Only applicable to CPAs under Scenario III} \quad (3) \end{cases}$$

Where:

BE_y	Baseline emissions in year *y* (tCO_2e)
$BE_{CH_4,y}$	Baseline emissions due to methane recovery in year *y* (tCO_2e)
$BE_{Thermal,y}$	Baseline emissions from thermal energy generation in year y (tCO_2e)
$BE_{El,y}$	Baseline emissions from power generation in year y (tCO_2e)

1. Calculation of $BE_{CH4,y}$

According to AMS-III.D (Ver.18.0), $BE_{CH_4,y}$ are calculated by using one of the following two options:

(a) 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_o);

(b) Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (*SVS*) content.

Option (a) is adopted in the CPAs under the PoA, which is as below:

$$BE_{CH_4,y} = GWP_{CH_4} * D_{CH_4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \quad (4)$$

Where:

$BE_{CH_4,y}$	Baseline emissions duet to biogas recovery in year *y* (tCO_2e)
GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (21)
D_{CH_4}	CH_4 density (0.00067 t/m^3 at room temperature (20ºC) 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^3 CH_4/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)[17]

Determination of $B_{0,LT}$

According to AMS-III.D (Ver.18.0), the maximum methane-producing capacity of the manure (B_o) varies by species and diet. The preferred method to obtain (B_o) measurement values is to use data from country-specific published sources. Since the country specific B_o values are not available, default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 can be used. There are two options for B_o default values:

(I) B_o default values applicable to developed countries can be used provided the following four conditions are satisfied:

- The genetic source of the livestock originates from an Annex I Party;
- The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;
- The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);
- The project specific animal weights are more similar to developed country IPCC default values.

Otherwise,

(II) B_o default values applicable to developing countries would be used.

When developed country values are used in the CPA, relevant parameters including the genetic source of the livestock and formulated feed rations (FFR) will be monitored, and when the developing country values are used in the CPA, there is no need to monitor the parameters described above.

[17] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

Determination of $VS_{LT,y}$

Volatile solids (*VS*) are the organic material in livestock manure and consist of both biodegradable and non-biodegradable fractions. For the calculations the total *VS* excreted by each animal species is required.

Because the country specific VS values are not available, IPCC default values from *2006 IPCC Guidelines for National Greenhouse Gas Inventories* Volume 4 chapter 10 table 10 A-4 to 10 A-9 can be used provided that the project participants assess the suitability of those data to the specific situation of the treatment site particularly with reference to feed intake levels.

There are two options for VS default values:

(I) VS default values applicable to developed countries can be used provided the following four conditions are satisfied:

- The genetic source of the livestock originates from an Annex I Party;
- The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;
- The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);
- The project specific animal weights are more similar to developed country IPCC default values.

Otherwise,

(II) VS default values applicable to developing countries would be used.

When developed country values are used in the CPA, relevant parameters including the genetic source of the livestock and formulated feed rations (FFR) will be monitored, and when the developing country values are used in the CPA, there is no need to monitor the parameters described above.

In case default IPCC values for *VS* are adjusted for a site-specific average animal weight, it shall be well explained and documented. The following equation shall be used:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \qquad (5)$$

Where:

$VS_{LT,y}$	Volatile solids for livestock *LT* entering the animal manure management system in year *y* (on a dry matter weight basis, kg dm/animal/year)
W_{site}	Average animal weight of a defined livestock population at the project site (kg)
$W_{default}$	Default average animal weight of a defined population, this data is sourced from IPCC 2006 (kg)
$VS_{default}$	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day)
nd_y	Number of days in year *y* where the animal manure management system is operational

In case of sequential treatment stages, the reduction of the volatile solids during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with volatile solids adjusted for the reduction from the previous treatment stages by multiplying by (1-RVS), where RVS is the relative reduction of volatile solids from the previous stage. The relative reduction (RVS) of volatile solids depends on the treatment technology and should be estimated in a conservative manner. Default values

for different treatment technologies can be found in the table in annex 1 of AMS-III.D (Ver.18.0).

Determination of MCF_j

Methane Conversion Factors (*MCF*) values are determined for a specific manure management system and represent the degree to which B_o is achieved. Where available country-specific *MCF* values that reflect the specific management systems used in particular countries or regions shall be used. Since the country-specific *MCF* is unavailable, the IPCC default values provided in table 10.17 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories* Volume 4 Chapter 10 will therefore be adopted in a specific SSC-CPA according to the type of the manure management system in baseline scenario and the annual average temperature where the CPA locates.The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.

Determination of $N_{LT,y}$

According to AMS-III.D (Ver.18.0), the annual average number of animals ($N_{LT,y}$) are determined as follows:

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right) \quad (6)$$

Where:

$N_{LT,y}$	Annual average number of animals of type LT in year y (numbers)
$N_{da,y}$	Number of days animal is alive in the farm in the year *y* (numbers)
$N_{p,y}$	Number of animals produced annually of type *LT* for the year *y* (numbers)

2. Calculation of $BE_{Thermal,y}$

According to AMS-I.C (Ver.19.0), baseline emissions from thermal energy generation in the CPA includes $BE_{thermal,y,1}$ from fossil fuel used in the boiler to generate steam/heat and/or $BE_{thermal,y,2}$ from fossil fuel used in the equipments whose maximum output capacity are less than 45 kW thermal, e.g. biogas stoves, to generate thermal energy. In each CPA, the project replace fossil fuel with biogas ($BG_{biogas-1,PJ,y}$) as fuel of boiler system for thermal energy generation and/or biogas ($BG_{biogas-2,PJ,y}$) as fuel of equipments whose maximum output capacity are less than 45 kW thermal for thermal energy generation respectively.Therefore, $BE_{Thermal,y}$ can be calculated as follows:

$$BE_{thermal,y} = BE_{thermal,y,1} + BE_{thermal,y,2} \quad (7)$$

Where:

$BE_{thermal,y}$	Baseline emissions from thermal generation in year y (tCO_2e)
$BE_{thermal,y,1}$	The baseline emissions from steam/heat displaced by the CPA during the year y (tCO_2e)
$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the CPA using biogas during the year *y* (tCO_2e)

a. Determination of $BE_{thermal,y,1}$

According to AMS-I.C (Ver.19.0), for steam/heat produced using fossil fuels, the baseline emissions are calculated as follows:

$$BE_{thermal,y,1} = [EG_{theraml,y} / \eta_{BL,1}] * EF_{FF,CO_2} \quad (8)$$

Where:

$BE_{thermal,y,1}$	The baseline emissions from steam/heat displaced by the CPA during the year y (tCO_2e)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
$\eta_{BL,1}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the CPA
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (tCO_2/TJ)

For household and/or farms applications, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible, as in the case of biogas stoves, gasifiers, driers, water heaters etc, the project output energy shall be estimated based on consumption of the biogas (in terms of energy quantity) times the efficiency of the project equipment. The equation below shall be used:

$$\begin{aligned} BE_{thermal,y,2} &= [HG_{PJ,y} / \eta_{BL,2}] * EF_{FF,CO_2} \\ &= \{[B_{biogas,PJ,y} * NCV_{biogas} * \eta_{PJ}] / \eta_{BL,2}\} * EF_{FF,CO_2} \end{aligned} \quad (9)$$

Where:

$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the project activity using biogas during the year y (tCO_2)
$HG_{PJ,y}$	The net quantity of thermal energy supplied by the project activity using biogas during the year *y* (TJ)
$\eta_{BL,2}$	Efficiency of the baseline equipment being replaced (determined as per paragraph 31)
η_{PJ}	Efficiency of the project equipment measured using representative sampling methods or based on referenced literature values. The efficiency tests shall be conducted following the guidance provided in the relevant national/international standards
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline (tCO_2/TJ)
$B_{biogas,PJ,y}$	The net volume of the biogas consumed in year y, i.e. $BG_{biogas-2,PJ,y}$ (m^3)
NCV_{biogas}	The net calorific value of the biogas (TJ/m^3)

3. Calculation of $BE_{El,y}$

According to AMS-I.F (Ver.2.0), the baseline emissions $BE_{El,y}$ from power generation are the product of amount electricity displaced with the electricity produced by the project using the biogas ($BG_{biogas-3,PJ,y}$) and an emission factor.

$BE_{El,y}$ should be calculated as below:

$$BE_{El,y} = EG_{BL,y} * EF_{grid,CM,y} \quad (10)$$

$BE_{El,y}$	Baseline emissions from power generation in year y (tCO_2)
$EG_{BL,y}$	Quantity of the grid electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{grid,CM,y}$	CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

Calculation of $EF_{grid,CM,y}$

According to ASM-I.F, emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D.

The emission factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system";

OR

(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

A combined margin (CM) is adopted to calculate the emission reductions. The calculating process will be in accordance with steps of Tool to calculate the emission factor for an electricity system (version 02.2.1) and the latest version of *Baseline Emission Factors for Regional Power Grids in China* published by Chinese DNA at the time of CPA-DD submission to the DOE for validation. The detailed calculating processes are as follows:

Step 1: Identify the relevant electricity systems.
Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Step 3: Select a method to determine the operating margin (OM).
Step 4: Calculate the operating margin emission factor according to the selected method.
Step 5: Calculate the build margin (BM) emission factor.
Step 6: Calculate the combined margin (CM) emission factor.

The detailed calculating processes are:

Step 1 Identify the relevant electricity systems

Identify the electricity system and its covered areas that the CPA connects to, according to the "Tool to calculate the emission factor for an electricity system" and delineation of electricity system given by Chinese DNA.

Part of the CPAs physically connect through transmission and distribution lines to the CCPG covering Chongqing City, Henan, Sichuan, Hubei, Jiangxi and Hunan Province, and part of the CPAs physically connect through transmission and distribution lines to the CSPG covering Guangdong, Yunnan , Guizhou, Hainan Province and Guangxi Zhuang Autonomous Region. Correspondingly, the relevant electricity system of the CPA depends on the concrete grid (CCPG/CSPG) the CPA connects to.

Step 2 Choose whether to include off-grid power plants in the project electricity system (optional)

According to the tool, project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I is chosen to calculate the operating margin and build margin emission factor..

Step 3 Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

In the five most recent years where data are available, the low-cost/must run resources [18]constituted less than 50% [19]of total power generation of the grid. As a result, the simple OM method can be used to calculate the operating margin emission factor ($EF_{grid,OM,y}$) of the CPA.

To calculate the simple OM emission factor of the grid, the ex-ante option is adopted by using 3-year generation-weighted average based on the most recent data at the time of the CDM-PDD submission to the DOE for validation .

Step 4 Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. It may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit;[20] or

[18] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

[19]The concrete demonstration will be filled in the CPA-DD.

[20] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

According to the tool, Option B can only be used if:
(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

The fuel consumption data in China is not available for each power plant/unit, thus Option A is not applicable. According to the latest version of Baseline Emission Factors for Regional Power Grids in China, only the nuclear and renewable power generation is considered as low-cost/must run power sources in China and the quantity of electricity supplied to the grid by these sources is known. Further, the off-grid power plants are not included in the calculation as mentioned in the above. So Option B is adopted to calculate the simple OM emission factor.

Under this Option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} * NCV_{i,y} * EF_{co2,i,y})}{EG_y} \quad (11)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y(t CO_2/MWh)

$FC_{i,y}$ = Amount of fossil fuel type *i* consumed by power plant/unit *m* in year (y) (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{co2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (t CO_2/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year *y*

y = The relevant year as per the data vintage chosen in Step 3.

Step 5 Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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of low-cost/must-run units.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the CPA, option 1 is chosen to calculate Build Margin emission factor ($EF_{grid, BM, y}$).

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geqslant 20\%}$) and determine their annual electricity generation ($AEG_{SET\geqslant 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geqslant 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activityies, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM>10yrs}$).

The Build Margin Emission Factor ($EF_{grid,BM,y}$) is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} * EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (12)$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (t CO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid *y* power unit *m* in year *y* (MWh)
$FE_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (t CO_2/MWh)
m = power units included in the build margin
y = most recent historical year for which power generation data is available.

Due to data's unavailability, the BM calculation follows the guidance provided by CDM EB in the deviation. First, calculate the newly installed capacity and its power generation technology mix, then the weights of different power technologies in the newly installed capacity, finally the BM emission factor base on the emission factors of different types of most advanced commercial generation technologies.

Because the generating capacity of the coal-fired, oil-fired and gas-fired power plants can not be separated from the existing statistical data, the BM calculation adopts the following method: First, use the available data in the energy balance tables on the most recent year to calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, calculate the emission factor of the fossil fuel fired power generation in each grid using the above proportions as the weights and the emission factors of the most advanced commercial generation technologies as the reference. Finally, the BM emission factor is multiplied by the proportion of fossil fuel fired power generation and the proportion of fossil fuel fired power plants in the newly added 20% capacity. Concrete steps and the formula for BM are as follows:

Sub-step 5a. Calculating the share of CO_2 emission of different fuel-fired power plants in the total CO_2 emissions

$$\lambda_{coal,y} = \frac{\sum_{ieCOAL,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}} \quad (13)$$

$$\lambda_{oil,y} = \frac{\sum_{ieOIL,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}} \quad (14)$$

$$\lambda_{gas,y} = \frac{\sum_{ieGAS,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{co2i,j,y}} \quad (15)$$

Where:
$F_{i,j,y}$ = the amount of fuel *i* (in a mass or volume unit) consumed by project *j* in year *y*;
$NCV_{i,j}$ = Net calorific value (energy content) of fossil fuel type *i* consumed by province *j* (GJ/mass or volume unit)

$EF_{co2,i,j,y}$ = CO_2 emission coefficient of fossil fuel type *i* (t CO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provincial sub-grids *j* and the percent oxidation of fuel in year *y*;

Coal, Oil and Gas is the footnote for solid fuels, liquid fuels and gas fuels.

Sub-step 5b. Calculation the emission factor of fuel-fired power technology.

$$EF_{Thermal,y} = \lambda_{Coal,y} * EF_{Coal,Adv,y} + \lambda_{Oil,y} * EF_{Oil,Adv,y} + \lambda_{Gas,y} * EF_{Gas,Adv,y} \quad (16)$$

Where:
$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ *and* $EF_{Gas,Adv,y}$ represent the emission factors of the commercially available most advanced coal, oil and gas fired power technology.

Sub-step5c. Calculating the $EF_{grid,BM,y}$

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} * EF_{Thermal,y} \quad (17)$$

Where:
$CAP_{Total,y}$ is the newly increment of total installed capacity;
$CAP_{Thermal,y}$ is the newly increment of fuel-fired installed capacity.

The $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ of the first crediting period of the CPA is calculated ex-ante and will not change during the first crediting period. For the second crediting period of the CPA, the $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ should be updated based on the latest version of *Baseline Emission Factors for Regional Power Grids in China* at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period of the CPA, the $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ used for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 6. Calculate the combined margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:
(a) weighted average CM; or
(b) simplified CM
The weighted average CM method should be used as the preferred option.

Method (a) is adopted for calculating the combined margin emission factor of the CPA:

$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} \quad (18)$$

Where:
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emission factor (%)
w_{BM} = Weighting of build margin emission factor (%)

The weight w_{OM} and w_{BM} are taken both by 0.5 for the first crediting period of the CPA; and w_{OM}=0.25 and w_{BM}=0.75 for the second and third period of the CPA.

For the detailed calculation, please refer to CPA-DD.

Ⅱ. Calculate project emissions

The project emission PE_y of the CPA is sum of the AMS-III.D (Ver.18.0) ($PE_{y,D}$) and/or AMS-I.C (Ver.19.0) ($PE_{y,C}$) and/or AMS-I.F (Ver.2.0) ($PE_{y,F}$) component, which can be calculated as follows:.

$$\begin{cases} PE_y = PE_{y,D} + PE_{y,C} & \text{Only applicable to CPAs under Scenario I} \quad (19) \\ PE_y = PE_{y,D} + PE_{y,F} & \text{Only applicable to CPAs under Scenario II} \quad (20) \\ PE_y = PE_{y,D} + PE_{y,C} + PE_{y,F} & \text{Only applicable to CPAs under Scenario III} \quad (21) \end{cases}$$

Where:

PE_y	Project emission in year y (tCO_2e)
$PE_{y,D}$	Project emission of AMS-III.D (Ver.18.0) component in year y (tCO_2e)
$PE_{y,C}$	Project emission of AMS-I.C (Ver.19.0) component in year y (tCO_2e)
$PE_{y,F}$	Project emission of AMS-I.F (Ver.2.0) component in year y (tCO_2e)

(I) According to AMS-III.D (Ver.18.0), Project activity emissions consist of:

(a) Physical leakage of biogas in the manure management systems which includes production, collection and transport of biogas to the point of flaring/combustion or gainful use ($PE_{PL,y}$);

(b) Emissions from flaring or combustion of the gas stream ($PE_{flare,y}$);

(c) CO_2 emissions from use of fossil fuels or electricity for the operation of all the installed facilities ($PE_{power,y}$);

(d) CO_2 emissions from incremental transportation distances($PE_{transp,y}$);

(e) Emissions from the storage of manure before being fed into the anaerobic digester ($PE_{storage,y}$).

$$PE_{y,D} = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (22)$$

Where:

$PE_{y,D}$	Project emission of AMS-III.D (Ver.18.0) component in year y (tCO_2e)
$PE_{PL,y}$	Emissions due to physical leakage of biogas in year y (tCO_2e)
$PE_{flare,y}$	Emissions from flaring or combustion of the biogas stream in the year y (tCO_2e)
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (tCO_2e)
$PE_{transp,y}$	Emissions from incremental transportation in the year y (tCO_2e), as per relevant paragraph in AMS-III.F
$PE_{storage,y}$	Emissions from the storage of manure (tCO_2e)

1. Determination of $PE_{PL,y}$

According to AMS-III.D (Ver.18.0), in case option in paragraph 9(a) is chosen, it is determined that $PE_{PL,y}$ can be calculated as follows:

$$PE_{PL,y} = 0.10 * GWP_{CH_4} * D_{CH_4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (23)$$

Where:

$PE_{PL,y}$	Emissions due to physical leakage of biogas in year *y* (tCO_2e)
$MS\%_{i,y}$	Fraction of manure handled in system *i* in year *y*

If the project activity involves sequential manure management systems, the procedure specified in paragraph 10 (e) of ASM-III.D shall be used to estimate the project emissions due to physical leakage of biogas in each stage.

2. Determination of $PE_{flare,y}$

In case of flaring/combustion of biogas, project emissions are estimated using the procedures described in the "Tool to determine project emissions from flaring gases containing methane".

According to the tool above, $PE_{flare,y}$ is calculated as per the formula below:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} * (1 - \eta_{flare,h}) * \frac{GWP_{CH4}}{1000} \quad (24)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h (kg/h)
$\eta_{flare,h}$	Flare efficiency in hour h
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$TM_{RG,h} = FV_{RG,h} * fv_{CH4,RG,h} * \rho_{CH4,n} \quad (25)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour (kg/h)
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h(m^3/h), i.e. $BG_{biogas-4,PJ,y}$
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour h (NB: this corresponds to $fv_{i,RG,h}$ where i refers to methane) ,i.e. $w_{CH4,y}$
$\rho_{CH4,n}$	Density of methane at normal conditions (1atm and 0ºC) (0.716)(kg/m^3)

In case of **enclosed flares and use of the default value** for the flare efficiency, the flare efficiency in the hour h ($\eta_{flare,h}$) is:

- 0%, if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h.
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are

not met at any point in time during the hour h.

• 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.

In case of **open flares**, the flare efficiency in the hour h ($\eta_{flare,h}$) is

• 0%, if the flame is not detected for more than 20 minutes during the hour h.

• 50%, if the flare is detected for more than 20 minutes during the hour h.

If all biogas generated by the CPA is used for energy generation, i.e., no biogas is flared, there will be no need to consider $PE_{flare,y}$ and no need to monitor the relative parameters to calculate the $PE_{flare,y}$.

3. Determination of $PE_{power,y}$

As fossil fuel is not involved in a specific SSC-CPA, $PE_{power,y}$ is equivalent to project emissions from electricity consumption. According to AMS-III.D (Ver.18.0), project emissions from electricity consumption are determined as per the procedures described in AMS-I.D "Grid connected renewable electricity generation", which is calculated as below:

$$PE_{power,y} = EG_{PJ,ele,y} * EF_{grid,CM,y} \quad (26)$$

Where:

$PE_{power,y}$	CO_2 emissions from use of fossil fuels or electricity for the operation of all the installed facilities(tCO_2e)
$EG_{PJ,ele,y}$	Quantity of electricity consumed by the Project facilities in year *y* (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y (tCO_2e/MWh) calculated using the "*Tool to calculate the emission factor for an electricity system*"(ver.02.2.1)

4. Determination of $PE_{transp,y}$

According to AMS-III.D, relevant procedure prescribed in AMS-III.F "Avoidance of methane emissions through composting" will be applied to determine the project emissions due to incremental transport distances ($PE_{transp,y}$) are calculated based on the incremental distances between:

(i) The collection points of biomass and/or manure and the compost treatment site as compared to the baseline solid waste disposal site or manure treatment site;

(ii) When applicable, the collection points of wastewater and treatment site as compared to baseline wastewater treatment site;

(iii) Treatment sites and the sites for soil application, land filling and further treatment of the produced compost.

The emissions from incremental transportation are calculated as below:

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO_2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO_2} \quad (27)$$

Where:

$PE_{transp,y}$	Emissions from incremental transportation in the year y (tCO_2e)
Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year y

	(tonnes)
CT_y	Average truck capacity for transportation (tonnes/truck)
DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)
EF_{CO2}	CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default values or local values may be used)
$Q_{y,treatment}$	Quantity of compost produced in year y (tonnes)
$CT_{y,treatment}$	Average truck capacity for compost transportation (tonnes/truck)
$DAF_{treatment}$	Average distance for compost transportation (km/truck)

If compared to the baseline scenario, no incremental transport distance exists in the CPA, there will be no need to consider $PE_{transp,y}$ and no need to monitor the relative parameters to calculate the $PE_{transp,y}$.

5. Determination of $PE_{storage,y}$

Project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for if both condition (a) and condition (b) below are satisfied:

(a) The storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester; and

(b) The dry matter content of the manure when removed from the animal barns is less than 20%.

The following method shall be used to calculate project emissions from manure storage:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k(AI_l-d)}) * MCF_l * B_{o_{LT}})\right] \quad (28)$$

Where:

$PE_{storage,y}$	Project emissions on account of manure storage in year y (tCO_2e)
AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device *l* (days)
$VS_{LT,d}$	Amount of volatile solid production by type of animal *LT* in a day (kg VS/head/d)
$MS\%_l$	Fraction of volatile solids (%) handled by storage device *l*。
k	Degradation rate constant (0.069)
d	Days for which cumulative methane emissions are calculated; d can vary from 1 to 45 and to be run from 1 up to AI_l
MCF_l	Annual methane conversion factor for the project manure storage device l from Table 10.17, Chapter 10, Volume 4

If all manure of the CPA is fed into manure treatment system in 24 hours, there will be no need to consider $PE_{storage,y}$ and no need to monitor the relative parameters to calculate $PE_{storage,y}$.

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(II) According to AMS-I.C (Ver.19.0), project activity emissions of AMS-I.C (Ver.19.0). component $PE_{y,C}$ consist of:

(a) CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
(b) CO_2 emissions from electricity consumption by the project activity using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";
(c) Any other significant emissions associated with project activity within the project boundary.

The project emissions from on-site consumption of fossil fuels and electricity due to the project activity are demonstrated as $PE_{power,y}$ above. And there are no other significant emissions associated with project activity within the project boundary.Therefore, the $PE_{y,C}$=0 tCO_2e.

(III) According to AMS-I.F (Ver.2.0), for energy generation projects using biogas, the $PE_{y,F}$=0 tCO_2e.

In addition, the CO_2 emissions from on-site consumption of fossil fuels due to the project activity has been demonstrated as $PE_{power,y}$ above.

Ⅲ. Calculate Leakage emissions

No energy generating equipment is transferred from outside the boundary to each CPA under the PoA. In addition, the collection/processing/transportation of animal manure is inside the project boundary. As per AMS-I.C (Ver.19.0), AMS-I.F (Ver.2.0) and AMS-III.D (Ver.18.0), leakage can be neglected. Therefore, leakage emissions of AMS-III.D component $LE_{y,D}$=0 tCO2e, leakage emissions of AMS-I.C component $LE_{y,C}$=0 tCO2e, and leakage emissions of AMS-I.F component $LE_{y,F}$=0 tCO2e.

IV. Calculate Emission Reductions

Emission reductions achieved by a specific SSC-CPA during a given year can be estimated ex-ante as below:

$$ER_y = ER_{y,D} + ER_{y,C} = BE_{CH_4,y} - PE_{y,D} - LE_{y,D} + BE_{Thermal,y} - PE_{y,C} - LE_{y,C}$$

Only applicable to CPAs under Scenario I (29)

$$ER_y = ER_{y,D} + ER_{y,F} = BE_{CH_4,y} - PE_{y,D} - LE_{y,D} + BE_{El,y} - PE_{y,F} - LE_{y,F}$$

Only applicable to CPAs under Scenario II (30)

$$ER_y = ER_{y,D} + ER_{y,C} + ER_{y,F}$$
$$= BE_{CH_4,y} - PE_{y,D} - LE_{y,D} + BE_{Thermal,y} - PE_{y,C} - LE_{y,C} + BE_{El,y} - PE_{y,F} - LE_{y,F}$$

Only applicable to CPAs under Scenario III (31)

Where:

ER_y	Emission reductions in year *y* (tCO_2e)
$ER_{y,D}$	Emission reductions of AMS-III.D (Ver.18.0)component in year y (tCO_2e)
$ER_{y,C}$	Emission reductions of AMS-I.C (Ver.19.0)component in year y (tCO_2e)
$ER_{y,F}$	Emission reductions of AMS-I.F (Ver.2.0)component in year y (tCO_2e)

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

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Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential (GWP) of CH_4
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value
Any comment:	21 for the first commitment period, and Shall be updated according to any future COP/MOP decisions.

Data / Parameter:	D_{CH4}
Data unit:	t/m^3
Description:	CH_4 density
Source of data used:	AMS-III.D (Ver.18.0)
Value applied:	0.00067 (room temperature 20ºC and 1atm pressure)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Recommended by the methodology of AMS-III.D (Ver.18.0).
Any comment:	According to "Tool to determine project emissions from flaring gases containing methane", under the condition of 1atm and 0ºC, the CH_4 density is 0.000716

Data / Parameter:	MCF_j
Data unit:	%
Description:	Annual methane conversion factor (MCF) for the baseline animal manure management system "j"
Source of data used:	IPCC 2006 table10.17
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS-III.D (Ver.18.0), when national special value is unavailable, IPCC default value is used.
Any comment:	-

Data / Parameter:	UF_b
Data unit:	-
Description:	Model correction factor to account for model uncertainties

Source of data used:	AMS-III.D (Ver.18.0)
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	Recommended by the methodology of AMS-III.D (Ver.18.0).
Any comment:	-

Data / Parameter:	$B_{O,LT}$
Data unit:	m^3CH_4/kg VS
Description:	Maximum methane producing potential of the volatile solid generated for animal type "LT"
Source of data used:	IPCC 2006 table10A-4 to 10A-9
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS III.D (Ver.18.0)., when national special value is unavailable, IPCC default value is used.
Any comment:	-

Data / Parameter:	$MS\%_{Bl,j}$
Data unit:	%
Description:	Fraction of manure handled in baseline animal manure management system "j"
Source of data used:	CPA implementer
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	All manure handled in baseline animal manure management.
Any comment:	-

Data / Parameter:	MCF_l
Data unit:	%
Description:	Annual methane conversion factor (MCF) for the project manure storage device l
Source of data used:	IPCC 2006 table10.17
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS-III.D, when national special value is unavailable, IPCC default value is used.

Any comment:	Used to calculate $PE_{storage,y}$

Data / Parameter:	$W_{default}$
Data unit:	kg
Description:	Default average animal weight of a defined population
Source of data used:	IPCC 2006 table10A-4 to 10A-9
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value.
Any comment:	-

Data / Parameter:	$VS_{default}$
Data unit:	kg dm/animal/day
Description:	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population
Source of data used:	IPCC 2006 table10A-4to 10A-9
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value.
Any comment:	-

Data / Parameter:	NCV_{biogas}
Data unit:	MJ/m^3
Description:	Net calorific value (energy content) per volume unit of biogas
Source of data used:	China Energy Statistical Yearbook, 2010
Value applied:	20.908
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determine once in the first year of the crediting period
Any comment:	-

Data / Parameter:	$EF_{FF,CO2}$
Data unit:	tCO_2e/TJ
Description:	CO_2 emission factor of fossil fuel that would have been used in the baseline
Source of data used:	Obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used.
Value applied:	Please see specific CPA-DD

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

Data / Parameter:	EF_{CO2}
Data unit:	$kgCO_2e/km$
Description:	CO_2 emission factor from fuel use due to transportation
Source of data used:	Obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used.
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	$w_{CH4,y}$
Data unit:	-
Description:	Methane fraction of biogas
Source of data used:	AMS-III.D (Ver.18.0)
Value applied:	60%
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AMS-III.D (Ver.18.0), a default value of 60% methane content can be used.
Any comment:	-

Data / Parameter:	$\eta_{BL,1}$
Data unit:	-
Description:	The efficiency of the plant using fossil fuel that would have been used in the absence of the CPA
Source of data used:	Determined as per paragraph 30 of AMS-I.C (Ver.19.0)
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Methodology AMS-I.C (Ver.19.0).

Any comment:	-

Data / Parameter:	$\eta_{BL,2}$
Data unit:	-
Description:	Efficiency of the baseline equipment being replaced.
Source of data used:	Determined as per paragraph 31 of AMS-I.C (Ver.19.0)
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Methodology AMS-I.C (Ver.19.0).
Any comment:	-

Data / Parameter:	η_{PJ}
Data unit:	-
Description:	Efficiency of the project activity equipment
Source of data used:	Determined by equipment specification and/or document value
Value applied:	Please see individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$\mathbf{EF_{grid,OM,y}}$
Data unit:	tCO_2/MWh
Description:	OM emission factor, ex-ante calculation and determination
Source of data used:	The latest version of Baseline Emission Factors for Regional Power Grids in China published by Chinese DNA at the time of CPA validation at http://cdm.ccchina.gov.cn
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official and authoritative statistics
Any comment:	

Data / Parameter:	$\mathbf{EF_{grid,BM,y}}$
Data unit:	tCO_2/MWh
Description:	BM emission factor, ex-ante calculation and determination
Source of data used:	The latest version of Baseline Emission Factors for Regional Power Grids in

	China published by Chinese DNA at the time of CPA validation at http://cdm.ccchina.gov.cn
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official and authoritative statistics
Any comment:	

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel i in year y
Source of data used:	China Energy Statistical Yearbook
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Energy Statistical Yearbook* is an authoritative publication.
Any comment:	Used to calculate the emission factors

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plants connected to the grid in year y
Source of data used:	China Energy Statistical Yearbook
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Energy Statistical Yearbook* is an authoritative publication.
Any comment:	Used to calculate the emission factors

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit of energy of fuel i in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 2, Energy, Chapter 1, Table 1.4)
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods	IPCC Default Value

and procedures actually applied :	
Any comment:	Used to calculate the emission factors

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated by power plant/unit m in year y
Source of data used:	China Electric Power Yearbook
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Used to calculate the emission factors

Data / Parameter:	$GENE_{best,coal}$
Data unit:	%
Description:	Best power supply efficiency by the most advanced technology commercially used in coal-fired plants in China
Source of data used:	The latest version of Baseline Emission Factors for Regional Power Grids in China published by Chinese DNA at the time of CPA validation .
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data from Chinese DNA
Any comment:	Used to calculate the emission factors

Data / Parameter:	$GENE_{best,oil}$ /$GENE_{best,gas}$
Data unit:	%
Description:	Best power supply efficiency by the most advanced technology commercially used in oil- and gas-fired plants in China
Source of data used:	The latest version of Baseline Emission Factors for Regional Power Grids in China published by Chinese DNA at the time of CPA validation .
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Used to calculate the emission factors

Data / Parameter:	CAP_y
Data unit:	MW

Description:	Installed generation capacity on different power sources connected to the grid
Source of data used:	China Electric Power Yearbook
Value applied:	Please see specific CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Electric Power Yearbook* is an authoritative publication.
Any comment:	Used to calculate the emission factors

Data / Parameter:	$\eta_{flare,h}$
Data unit:	%
Description:	Flare efficiency in the hour *h*
Source of data used:	Determined according to "Tool to calculate project emissions from flaring gases containing methane"
Value applied:	Please see specific CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to "Tool to calculate project emissions from flaring gases containing methane", in case of **enclosed flares and use of the default value** for the flare efficiency, the flare efficiency in the hour h ($\eta_{flare,h}$) is: • 0%, if the temperature in the exhaust gas of the flare (T_{flare}) is below 500°C for more than 20 minutes during the hour h. • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500°C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h. • 90%, if the temperature in the exhaust gas of the flare (Tflare) is above 500° for more than 40 minutes during the hour h and the manufacturers specifications on proper operation of the flare are met continuously during the hour h. In case of **open flares,** the flare efficiency in the hour h ($\eta_{flare,h}$) is • 0% if the flame is not detected for more than 20 minutes during the hour h. • 50%, if the flare is detected for more than 20 minutes during the hour h. The value will be determined through online monitoring the exhaust gas temperature of the flare in operation.
Any comment:	Used to calculate $PE_{flare,y}$

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

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

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Data / Parameter:	W_{site}
Data unit:	kg
Description:	Average animal weight of a defined livestock population at the project site
Source of data to be used:	CPA implementer
Value of data applied	Please see specific CPA-DD

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually recording
QA/QC procedures to be applied:	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
Any comment:	-

Data / Parameter:	nd_y
Data unit:	day
Description:	Number of days that the animal manure management system was operational in year y.
Source of data to be used:	Assumed 365 days in a specific SSC-CPA, actual data is from the monitoring.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	365
Description of measurement methods and procedures to be applied:	Annually, based on daily records and monthly aggregation. And if any farm has no operations on a given day it needs to be documented (e.g. logbook) and taken into account for the calculation of $BE_{ex\text{-}post}$.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$N_{da,y}$
Data unit:	Number
Description:	Number of days animal is alive in the farm in the year *y*
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on monthly records. The rolled-in date and rolled-out date of every animal will be recorded and rolled-in date will be also marked on the correspondent animal during its lifetime by the farm owners. So the average number of days animal is alive can be calculated.
QA/QC procedures to be applied:	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
Any comment:	-

Data / Parameter:	$N_{p,y}$
Data unit:	Number
Description:	Number of animals produced annually of type LT for the year *y*
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on monthly records. The farm owners will keep records of sales for every animal transaction, so the number of animals produced annually can be calculated.
QA/QC procedures to be applied:	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
Any comment:	-

Data / Parameter:	$MS\%_{i,y}$
Data unit:	%
Description:	Fraction of manure handled in system "i" in project activity in year y
Source of data to be used:	CPA implementer
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:	Annually, based on daily measurement and monthly aggregation. In case animal manure is treated in different treatment systems manure weight delivered to each system shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types will be recorded separately for cross-check. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required. Archive electronically and all data records will be kept until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	
Any comment:	-

Data / Parameter:	**Genetic source**
Data unit:	
Description:	Genetic source of the livestock
Source of data to be used:	CPA implementer
Value of data applied for the purpose of	Please see specific CPA-DD

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures to be applied:	-
Any comment:	It will be monitored when the developed values are used.

Data / Parameter:	**FFR**
Data unit:	
Description:	Formulated feed ratio
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures to be applied:	-
Any comment:	It will be monitored when the developed values are used.

Data / Parameter:	$MS\%_l$
Data unit:	%
Description:	Fraction of volatile solids (%) handled by storage device *l*
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Monthly. It is to be used to calculate possible project emissions due the storage of animal manure, as per paragraph 16 of AMS-III.D.
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{storage,y}$

Data / Parameter:	Q_y
Data unit:	tons
Description:	Quantity of raw waste/manure treated and/or wastewater co-treated in the year y
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	On-site data sheets recorded monthly using weigh bridge. Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier).
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	CT_y
Data unit:	tons/truck
Description:	Average truck capacity for transportation
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	On site measurement
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	DAF_w
Data unit:	km/truck
Description:	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods	Annually. On site measurement, assumption to be approved by DOE.

and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	$Q_{y,treatment}$
Data unit:	tons
Description:	Quantity of compost produced in year *y*
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	On-site data sheets recorded monthly using weigh bridge. Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier).
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	$CT_{y,treatment}$
Data unit:	tons/truck
Description:	Average truck capacity for compost transportation
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	On site measurement
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	$DAF_{treatment}$
Data unit:	km/truck
Description:	Average distance for compost transportation
Source of data to be used:	CPA implementer
Value of data applied for the purpose of	Please see specific CPA-DD

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually. On site measurement, assumption to be approved by DOE.
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{transp,y}$

Data / Parameter:	AI_l
Data unit:	days
Description:	Annual average interval between manure collection and delivery for treatment at a given storage device l (days)
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on monthly records. It is to be used to calculate possible project emissions due to the storage of animal manure, as per paragraph 16 of AMS-III.D.
QA/QC procedures to be applied:	
Any comment:	Used to calculate $PE_{storage,y}$

Data / Parameter:	T_{flare}
Data unit:	°C
Description:	Temperature in the exhaust gas of the flare
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500°C indicates that a significant amount of gases are still being burnt and that the flare is operating.
QA/QC procedures to be applied:	Thermocouples should be replaced or calibrated every year.
Any comment:	An excessively high temperature at the sampling point (above 700°C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow. Used to determine the $\eta_{flare,h}$ and calculate

	$PE_{flare,y}$.

Data / Parameter:	**Other flare operation parameters**
Data unit:	-
Description:	This should include all data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer's specifications including a flame detector in case of open flares. Such as flare operation hours.
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Measured continuously
QA/QC procedures to be applied:	Timing only during the flaring status.
Any comment:	The operation parameters will be monitored in accordance with the manufacturer's specification. Used to determine the $\eta_{flare,h}$ and calculate $PE_{flare,y}$.

Data / Parameter:	**FE**
Data unit:	%
Description:	The flare efficiency
Source of data to be used:	Determined according to "Tool to calculate project emissions from flaring gases containing methane" and paragraph 22 of AMS-III.D.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	As per the "Tool to determine project emissions from flaring gases containing Methane", regular maintenance shall be carried out to ensure optimal operation of flares. If there is no flare in the CPA, a destruction efficiency of 100% can be used for the amount that is combusted for energy.
QA/QC procedures to be applied:	
Any comment:	When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy. When the methane is flared, the FE is equal to the $\eta_{flare,h}$ (default value) to determine the $PE_{flare,y}$.

Data / Parameter:	$BG_{biogas,PJ,y}$
Data unit:	m^3
Description:	The total volume of the biogas generated in year y.

Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on continuous flow measurement with daily accumulated volume reading. Flow meter(s) will be installed at the outlet of gas tank. Archive electronically and all data records will be kept until 2 years after the end of the crediting period. This parameter is used as cross-check.
QA/QC procedures to be applied:	Flow meter(s) will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Reasonable. If the biogas flow meter(s) employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need for separate monitoring of pressure and temperature of the biogas. Otherwise, the temperature and the pressure of the biogas shall be measured at the same time when the flow of the biogas is measured.

Data / Parameter:	$BG_{biogas-1,PJ,y}$
Data unit:	m^3
Description:	The volume of the biogas supplied to boilers in year y.
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on continuous flow measurement with daily accumulated volume reading. Flow meter(s) will be installed at the inlet of boiler(s). Archive electronically and all data records will be kept until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Reasonable. If the biogas flow meter(s) employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need for separate monitoring of pressure and temperature of the biogas. Otherwise, the temperature and the pressure of the biogas shall be measured at the same time when the flow of the biogas is measured.

Data / Parameter:	$BG_{biogas-2,PJ,y}$
Data unit:	m^3
Description:	The volume of the biogas supplied to the equipments whose maximum output capacity are less than 45 kW thermal, e.g. biogas stoves, in year y.
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with meter(s).
Value of data applied for the purpose of	Please see specific CPA-DD

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually, based on continuous flow measurement with daily accumulated volume reading. Flow meter(s) will be installed to measure the biogas supplied to the equipments whose maximum output capacity are less than 45 kW thermal, e.g. biogas stoves. Archive electronically and all data records will be kept until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	Flow meter(s) will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Reasonable. If the biogas flow meter(s) employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need for separate monitoring of pressure and temperature of the biogas. Otherwise, the temperature and the pressure of the biogas shall be measured at the same time when the flow of the biogas is measured.

Data / Parameter:	$BG_{biogas-3,PJ,y}$
Data unit:	m^3
Description:	The volume of the biogas supplied to power generator in year y
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on continuous flow measurement with daily accumulated volume reading. Flow meter(s) will be installed at the inlet of the generator. Archive electronically and all data records will be kept until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	Flow meter(s) will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Reasonable. If the biogas flow meter(s) employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need for separate monitoring of pressure and temperature of the biogas. Otherwise, the temperature and the pressure of the biogas shall be measured at the same time when the flow of the biogas is measured.

Data / Parameter:	$BG_{biogas-4,PJ,y}$
Data unit:	m^3
Description:	The volume of the biogas supplied to flare in year y
Source of data to be used:	0 for ex ante calculation, and it will be monitored during the crediting period.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of	Annually, based on continuous flow measurement with hourly accumulated

measurement methods and procedures to be applied:	volume reading. Flow meter(s) will be installed at the inlet of the flare. Archive electronically and all data records will be kept until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	Flow meter(s) will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Reasonable. If the biogas flow meter(s) employed measures flow, pressure and temperature and displays/outputs flow of biogas, there is no need for separate monitoring of pressure and temperature of the biogas. Otherwise, the temperature and the pressure of the biogas shall be measured at the same time when the flow of the biogas is measured.

Data / Parameter:	$EG_{thermal,y}$
Data unit:	TJ/yr
Description:	The net quantity of steam/heat supplied by the project activity during the year y
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Continuous monitoring, monthly recording. Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
QA/QC procedures to be applied:	Meter(s) will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meter(s) to be obtained from the manufacturers.
Any comment:	-

Data / Parameter:	Continuous operation of the thermal equipment/system
Data unit:	-
Description:	Continuous operation of the thermal equipment/system
Source of data to be used:	CPA implementer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance.
QA/QC procedures to	

be applied:	
Any comment:	-

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity displaced from the grid as a result of the implementation of the CDM project activity in year y
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with electricity meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Continuous monitoring, monthly recording. Electricity meter(s) will be installed to measure the quantity of the electricity displaced from the grid as a result of the implementation of the CDM project activity in year y
QA/QC procedures to be applied:	Electricity meter(s) will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meter(s) to be obtained from the manufacturers.
Any comment:	-

Data / Parameter:	$EG_{PJ, ele,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity consumed by the Project facilities in year *y*
Source of data to be used:	The data used come from the third party document (eg.FSR), the actual data should be measured with electricity meter(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see specific CPA-DD
Description of measurement methods and procedures to be applied:	Continuous monitoring, monthly recording. Electricity meter(s) will be installed to measure the quantity of the electricity consumed by the project activity in year y.
QA/QC procedures to be applied:	Electricity meter(s) will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meter(s) to be obtained from the manufacturers.
Any comment:	-

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

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The objective of the monitoring plan is to assure the complete, consistent, clear, and accurate monitoring and calculation of the project emission reductions during the whole crediting period. The CPA implementer is responsible for the implementation of the monitoring plan, and the consumers cooperate

with the CPA implementer. And on-site inspections will be conducted for each individual livestock farm during the verification of the CPA.

As per methodologies AMS-III.D (Ver.18.0), the emission reductions achieved by avoiding methane emissions will be determined *ex post* through direct measurement of the amount of methane fuelled, flared or gainfully used. It is likely that the project activity involves manure treatment steps with higher methane conversion factors (*MCF*) than the *MCF* for the manure treatment systems used in the baseline situation, therefore the emission reductions achieved by the project activity is limited to the *ex post* calculated baseline emissions minus project emissions using the actual monitored data for the project activity ($N_{LT,y}$, $MS\%_{i,y}$, $MS\%_{l}$, AI_l and in case adjusted values for animal weight are used as defined in paragraph 10 (c): $VS_{LT,y}$). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,D,ex\,post} = \min[(BE_{y,D,ex\,post} - PE_{y,D,ex\,post}),(MD_y - PE_{power,y,ex\,post})] \quad (32)$$

Where:

$ER_{y,D,ex\,post}$	Emission reductions of AMS-III.D (Ver.18.0) component achieved by the project activity based on monitored values for year y (tCO_2e)
$BE_{y,D,ex\,post}$	Baseline emissions calculated using equation 1 of AMS-III.D (Ver.18.0) (for projects using option in paragraph 9 (a)) using ex post monitored values of $N_{LT,y}$ and if applicable $VS_{LT,y}$
$PE_{y,D,ex\,post}$	Project emissions calculated using equation 5 of AMS-III.D (Ver.18.0) and relevant equation of AMS-III.F and AMS-I.D using *ex post* monitored values of $N_{LT,y}$, $MS\%_{i,y}$, $MS\%_l$, AI_l *and if applicable* $VS_{LT,y}$
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{power,y,ex\,post}$	Emissions from the use of fossil fuel and/or electricity for the operation of the installed facilities based on monitored values in the year *y* (tCO_2e).

In case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH_4,y} * D_{CH_4} * FE * GWP_{CH_4} \quad (33)$$

Where:

$BG_{burnt,y}$	Biogas flared or combusted in year y (m^3). According to AMS-III.D (Ver.18.0), the amount of biogas recovered $BG_{biogas,PJ,y}$ and fuelled, flared or used gainfully shall be monitored ex post, using flow meters. When the biogas combusted by the boiler system for thermal energy, the monitored parameter is $BG_{biogas-1,PJ,y}$. When the biogas combusted by the equipments whose maximum output capacity are less than 45 kW thermal, e.g. biogas stoves, for thermal energy, the monitored parameter is $BG_{biogas-2,PJ,y}$. When the biogas combusted by the power generation system for electricity, the monitored parameter is $BG_{biogas-3,PJ,y}$. When the biogas flared, the monitored parameter is $BG_{biogas-4,PJ,y}$. If the biogas flared ($BG_{biogas-4,PJ,y}$) and fuelled ($BG_{biogas-1,PJ,y}$, $BG_{biogas-2,PJ,y}$, $BG_{biogas-3,PJ,y}$) is continuously monitored separately, the two fractions can be added to determine the biogas recovered ($BG_{biogas,PJ,y}$). In that case, recovered biogas ($BG_{biogas,PJ,y}$) need not be monitored separately. And the $BG_{burnt,y}$ is determined as the monitored parameters $BG_{biogas,PJ,y}$, $BG_{biogas-1,PJ,y}$, $BG_{biogas-2,PJ,y}$, $BG_{biogas-3,PJ,y}$ and/or $BG_{biogas-4,PJ,y}$ accordingly.

$w_{CH4,y}$	Methane content in biogas in the year y (volume fraction).
FE	Flare efficiency in the year y (fraction). When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy. When the methane is flared, the FE is equal to the $\eta_{flare,h}$ to determine the $PE_{flare,y}$.

So the emission reductions achieved by the specific CPA will be determined *ex post* according to the following formula:

$$ER_y = ER_{y,D,ex\,post} + ER_{y,C} = ER_{y,D,ex\,post} + BE_{Thermal,y} - PE_{y,C} - LE_{y,C}$$

Only applicable to CPAs under Scenario I (34)

$$ER_y = ER_{y,D,ex\,post} + ER_{y,F} = ER_{y,D,ex\,post} + BE_{El,y} - PE_{y,F} - LE_{y,F}$$

Only applicable to CPAs under Scenario II (35)

$$ER_y = ER_{y,D,ex\,post} + ER_{y,C} + ER_{y,F} = ER_{y,D,ex\,post} + BE_{Thermal,y} - PE_{y,C} - LE_{y,C} + BE_{El,y} - PE_{y,F} - LE_{y,F}$$

Only applicable to CPAs under Scenario III (36)

1. Data and parameters monitored

For monitoring parameters, please refer to Section E.7.1.

2. Monitoring organization

The CME will act as the overall supervisor of the PoA, preparing the operation and monitoring manual for CPAs, calculating emission reductions and preparing monitoring reports periodically to the DOE

The CPA implementers will undertake the monitoring of CPA operations including employee training, data collection and report to CME periodically.

This monitoring plan will be carried out by each monitoring team of CPA implementer under the supervision of the CME, designated by the CPA implementer, which consists of a team leader, an assistant and at least two operators. This team leader has the overall responsibility for the monitoring and verification process, training and managing all team members, and keep in touch with the CME.

The assistant will help the team leader to supervise the operation of the project, including data monitoring, negotiations with the consumers, and to collect financial data.

The operators will be responsible for calibrating and maintaining the meters, measuring and recording relevant readings, collecting, checking, archiving and managing data, and making summary according to the CDM project's requirements at a regular basis.

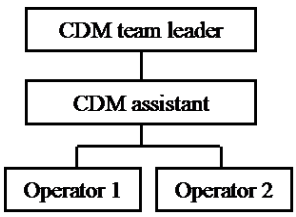

Figure E-2 Monitoring team organization

3. Installation of monitoring meters

Meter F[21] will be equipped at the end of gas tank for measurement of total generated biogas ($BG_{biogas,PJ,y}$) and/or meter F1 will be equipped at the entrance of boiler system to measure the biogas supplied to boiler system ($BG_{biogas-1,PJ,y}$) and/or F2 will be installed to measure the biogas supplied to the equipments whose maximum output capacity are less than 45 kW thermal, e.g. biogas stoves, ($BG_{biogas-2,PJ,y}$), and/or meter F3 will be equipped at the entrance of power generation system to measure the biogas supplied to the power generator ($BG_{biogas-3,PJ,y}$) , and/or metering system Fs will be equipped to measure the thermal energy supplied ($EG_{thermal,y}$) by the project activity, and/or E will be equipped to measure the electricity supplied ($EG_{BL,y}$) by the project activity, and E1 will be equipped to measure the electricity consumption ($EG_{PJ, ele,y}$) by the project activity.

In case the biogas is supplied to the flare, meter F4 will be equipped at the entrance of flare to measure the biogas supplied to flare ($BG_{biogas-4,PJ,y}$), and the thermocouple will be equipped to measure the temperature in the exhaust gas of the flare (T_{flare}).

Location of each meter is shown in the following figure:

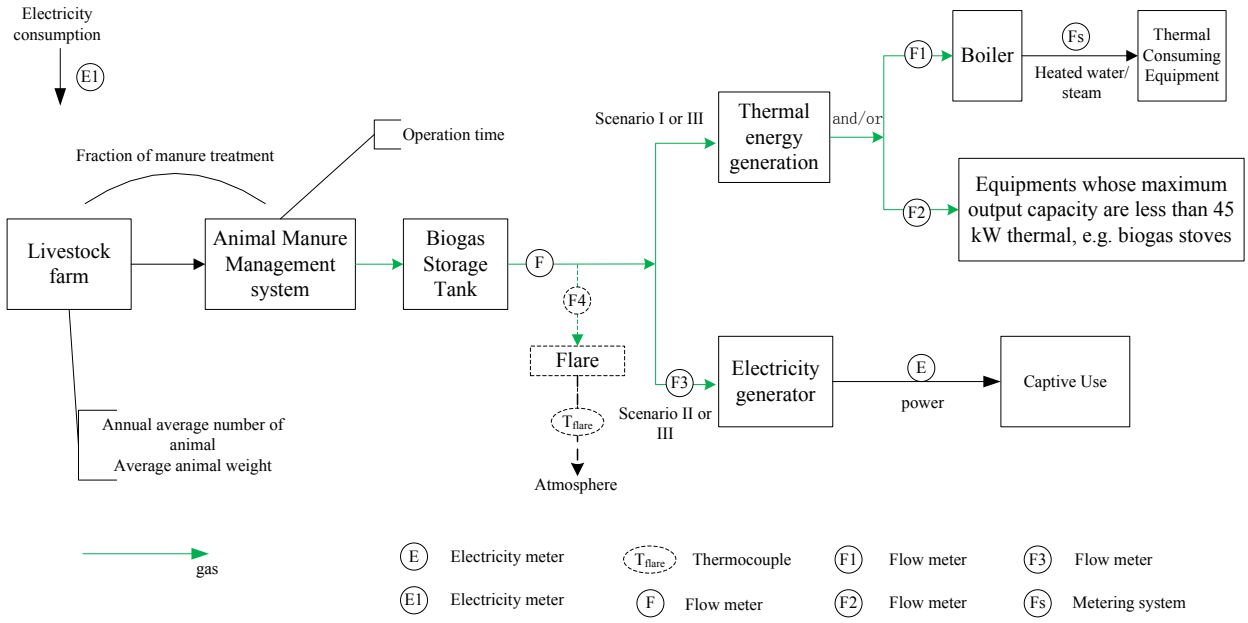

Figure E-3 Monitoring system

4. Equipment management system

The accuracy of the equipments will be satisfied with the related national standards, and the equipment will undergo routing maintenance and calibration subject to the appropriate industry and/or national standards and requirements by the CDM operator and outsourced company with the help of the operators. The calibrations will be complied with the related national standards. All the records will be maintained.

[21] In case the biogas flared ($BG_{biogas-4,PJ,y}$) and fuelled ($BG_{biogas-1,PJ,y}$, $BG_{biogas-2,PJ,y}$, $BG_{biogas-3,PJ,y}$) is continuously monitored separately, the two fractions can be added to determine the biogas recovered ($BG_{biogas,PJ,y}$). In that case, recovered biogas ($BG_{biogas,PJ,y}$) need not be monitored separately, i.e., the Meter F need not be equipped.

5. Data management

Hard copy documentation such as paper maps, diagrams and environmental assessment will be collected in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed and sent to the monitoring computer managed by the CME at a regular basis. All the data after internal validation should be saved up to 2 years after the end of the crediting period.

6. Disposing process of abnormity

If the error of data is caused by accidents during the crediting period, the CPA implementers and consumers will deal with it as contingency.CDM team should be informed about the accidents occurred at project site in time. The CDM team leader and assistant will analyze the rationality of data according to conservative rules of CDM projects. The data should be recorded and archived.

7. Verification of monitoring results

The responsibilities for verification of the projects are as follows:

- The CME and CPA implementers will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.
- The CME and CPA implementers will facilitate the verification through providing the DOE with all required necessary information, before, during and in the event of queries, after the verification.

The CME and CPA implementers will fully cooperate with the DOE and instruct CDM monitoring team and manage to be available for interviews and respond honestly to all questions from the DOE.

8. Training

Training will be done at a regular interval organized by the CME, and a local management team will be established to be responsible for giving operational and monitoring guidance and occasional trainings.

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)

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Date of completion of the application of the baseline study and monitoring methodology is 11/10/2012.

Innovative Carbon Investment Co., Ltd.
Address: Room 825, Jingchengjianguo, 5th Jianguomen North Avenue, Dongcheng District, Beijing 100005, P.R. China
Person in charge:
Lawrence Xu
Tel: 86-10-65174621
Fax: 86-10-65175899
Email: Lawrence.xu@mailici.com

Annex 1

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

Organization:	HuaQi Environmental Clean Technologies Co., Ltd.
Street/P.O.Box:	No.126 Xiangjiang Middle Road
Building:	No.3 Huasheng New Bund Garden Building
City:	Changsha
State/Region:	Hunan Province
Postfix/ZIP:	410005
Country:	China
Telephone:	+86-731-89799581
FAX:	+86-731-82859978
E-Mail:	huaqi.zhanghu@gmail.com
URL:	
Represented by:	Zhang Hu
Title:	
Salutation:	Mr.
Last Name:	Zhang
Middle Name:	
First Name:	Hu
Department:	
Mobile:	
Direct FAX:	+86-731-82859978
Direct tel:	+86-731-89799581
Personal E-Mail:	huaqi.zhanghu@gmail.com

Organization name	Department of Climate Change, National Development and Reform Committee of China
Street/P.O. Box	No.38, Yuetan South Street, Xicheng District
Building	
City	Beijing
State/Region	
Postcode	
Country	P.R. China
Telephone	+86 10 68502963
Fax	+86 10 68532358
E-mail	sunch@ccchina.gov.cn
Website	http://www.sdpc.gov.cn/
Contact person	Sun Cuihua
Title	
Salutation	Ms.
Last name	Sun
Middle name	
First name	Cuihua
Department	
Mobile	
Direct fax	+86 10 68502963
Direct tel.	+86 10 68532358
Personal e-mail	sunch@ccchina.gov.cn

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties in the PoA.

Annex 3

BASELINE INFORMATION

For details of baseline information, please refer to the CPA-DD.

Annex 4

MONITORING INFORMATION

No additional information

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