PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD) Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Title: Animal Manure Treatment Programme in Anhui Province, Jiangsu Province and Yunnan Province[1]

Version: 02

Date: 03/12/2012

Version No.	Date	Description and reason of revision
01	05/06/2012	GSC Version
02	20/12/2012	The first revised version based on CAR&CL.

A.2. Purpose and general description of the PoA

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1.Policy/measure or stated goal that the PoA seeks to promote

Animal Manure Treatment Programme in Anhui Province, Jiangsu Province and Yunnan Province (hereafter referred to as the PoA) is coordinated and managed by Beijing Huayu Xinda Consultation Co., Ltd. (hereafter referred to as the CME). The stated goal of the PoA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for energy generation, in order to avoid methane emissions due to the anaerobic lagoons and to replace electricity and/or thermal energy generated based on fossil fuel.

The biogas digester construction in livestock farms in Anhui Province, Jiangsu Province and Yunnan Province is encouraged by Local Rural Energy Office. Nevertheless, due to barriers such as high investment cost, operational uncertainty and low income generated for the livestock farmers, the biogas promotion faces significant hurdles in attracting livestock farmers and commercial financing. By offering an additional considerable income generated by carbon credits, the PoA will enhance the financial attractiveness and support the livestock farmers in introducing biogas systems.

[1] In the PDD of GSC version, the project title wrongly stated of "Animal Manure Treatment Programme in Anhui Province, Jiangsu Province and **Yunan** Province". As DOE has raised a CAR for this issue, the project title was revised to be correct as "Animal Manure Treatment Programme in Anhui Province, Jiangsu Province and **Yunnan** Province". As described in the Section A.5 of the PoA DD, the Physical/ Geographical boundary of the PoA was defined as the entire Anhui Province, Jiangsu Province and Yunnan Province. In which the "Yunnan Province" was located in the Southern West of China; its Longitude is 97°31'39"-106°11'47"E and Latitude of 21°8'32"-29°15'8"N.

The approach adopted to achieve this is two aspects:

1)Financial support: By offering an additional regular income generated by carbon credits, the PoA will support the project owner in maintenance and repairing the biogas digester system, in order to achieve the stable operation for a long period.

2)Technical support: The CME, be cooperated with the Rural Energy Office of Anhui, Jiangsu and Yunnan Province and the affiliated Local Rural Energy Offices, will provide further technical service during start up and operation of the biogas digester system. By this means the targeted project owner will actually receive long-term benefits.

Expected outcome of the proposed PoA is a large distribution of biogas digester construction in livestock farms in Anhui Province, Jiangsu Province and Yunnan Province on the one side and a more reliable operation of the installed systems on the other side. Therefore, the PoA clearly facilitates additional and sustainable development and will improve the living conditions of nearby residents.

2.Framework for the implementation of the proposed PoA

The CME is responsible for CDM capacity building to the project owner, 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 integrality and accuracy, and taking charge of the issues related CERs issuing activity.

The project owners under each CPA will be responsible for planning, financing arrangement and the detailed implementation of the project and monitoring plan of the project under the supervision of the CME.

In the absence of the PoA, animal manure would be left to decay anaerobically in the anaerobic lagoons without methane recovery and destruction, and equivalent amount of thermal energy would be generated based on fossil fuels as well as equivalent electricity would be generated by Power Grid (East China Power Grid (ECPG) for projects located in Anhui and Jiangsu Province; Southern China Power Grid (SCPG) for projects located in Yunnan Province). This is also the baseline scenario.

By recovery and utilization of biogas, the PoA can contribute to the reduction of greenhouse gases in two ways: 1) the biogas recovery system reduces methane emissions 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 reductions of the first CPA (CPA0001) is calculated, which is 3,882 tCO_2e per year and totally 38,820 tCO_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 CME

The PoA is a scheme developed by Beijing Huayu Xinda Consultation Co., Ltd. (the CME) to promote the building of biogas digester system and biogas recovery system in livestock farms in Anhui Province, Jiangsu Province and Yunnan Province. At Present, there is no mandatory law to enforce livestock

farmers to install animal manure treatment system with recovery and utilization of biogas. Therefore, this PoA is not implementing any mandatory policy or regulation of China.

The Confirmation that the proposed PoA is a voluntary action by the CME is based on the statement dated 05/06/2012. In addition, The China LOA was also confirmed that Beijing Huayu Xinda Consultation Co., Ltd. was authorized as China's participant to voluntarily participated in and carry out the PoA as the Coordinating/Managing Entity.

4.Contribution to sustainable development by the PoA

As a waste treatment and renewable energy utilization Programme, it can contribute to sustainable development in the following aspects:

Environmental benefits:

- Improving the local environment and human health. The proposed PoA aims to reduce negative environmental impacts of intensive livestock production through the installation of biogas digesters and biogas utilization systems. Treatment of large quantities of animal waste through digesters instead of lagoons will reduce organic material in wastewater, nuisance of odors, and bacteria. Therefore, it leads to better environmental conditions and better life quality in rural communities nearby the livestock farms.

Social and Economic benefits:

- Creating job opportunities. The PoA will increase local employment for skilled labour during construction, installation, operation, and maintenance of equipments and systems.
- Diversifying energy supply. The PoA will diversify energy sources through biogas production and biogas-based utilization systems. The implementation of the PoA can contribute to the reduction of the country's dependence on fossil fuel.

A.3. CMEs and participants of PoA

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✓**The CME of the PoA as the entity which communicates with the Board.**

Beijing Huayu Xinda Consultation Co., Ltd.

✓**Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.**

Beijing Huayu Xinda Consultation Co., Ltd.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Peoples' Republic of China (Host)	Beijing Huayu Xinda Consultation Co., Ltd. (Private entity)	Yes

A.5. Physical/ Geographical boundary of the PoA

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The programme is implemented in Anhui Province or Jiangsu Province or Yunnan Province, P.R. China, so the boundary of the entire Anhui Province, Jiangsu Province and Yunnan Province, P.R. China. Detailed physical location is labelled in Figure 1.

Province	Geographic Coordinate
Anhui Province	Longitude 114°54′-119°37′E; Latitude 29°41′- 34°38′N
Jiangsu Province	Longitude 116°18′-121°57′E; Latitude 30°45′-35°20′N
Yunnan Province	Longitude 97°31'-106°11'E; Latitude 21°8'-29°15'N

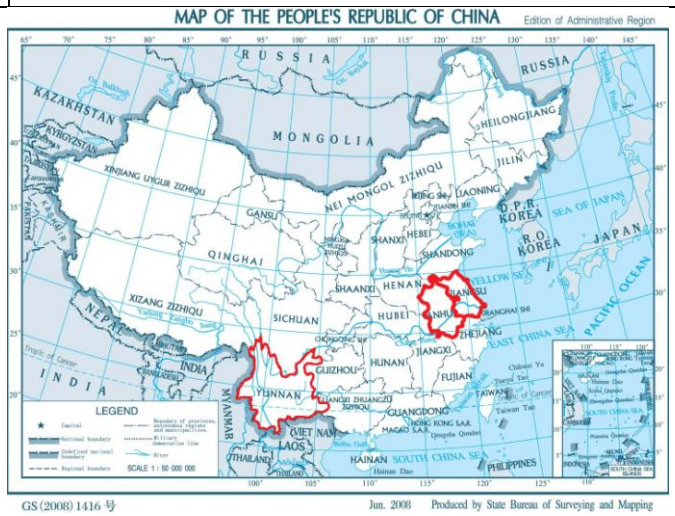

Figure 1.Location of the PoA

A.6. Technologies/measures

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Each CPA may include one or multiple project activities. All the project activities under the CPA of the PoA will introduce anaerobic manure treatment systems with biogas recovery to treat the manure collected from livestock farms, and then utilize the recovered biogas as fuel for thermal and/or electricity energy generation.

The technology flow employed in the project activities under the CPA includes manure treatment system, biogas recovery system and biogas utilization system.

The manure from livestock farm will firstly enter into adjusting tank in order to meet a given proportioning for fermentation, and subsequently enter into anaerobic reactor. Under anaerobic condition and proper temperature in the reactor, organic matter included in manure from livestock farm will be converted into biogas by methanogenic bacteria. The generated biogas will be recovered and then utilized for energy generation after desulphurization and dehydration. The slurry from the reactor will be reused in adjusting tank or be used for land application and the residue from the reactor will be used for land application.

The details technology flow is shown in the following figure:

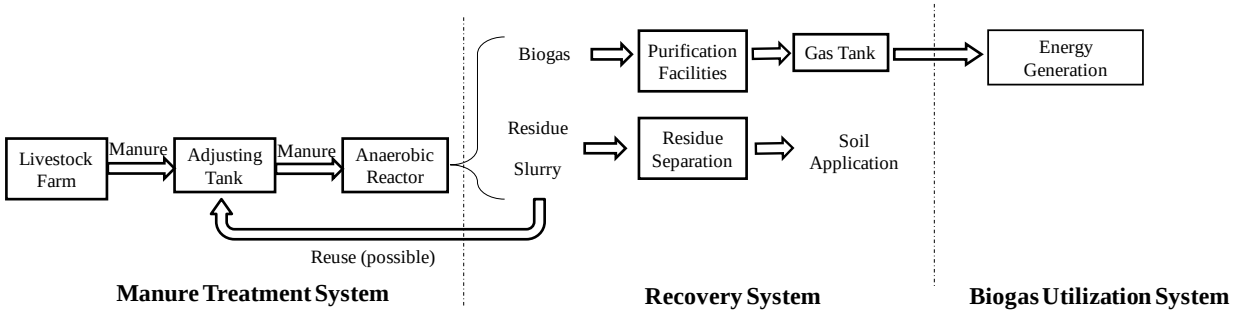

Figure 2.Technology flow adopted in the PoA

The design, construction and operation of the projects will be based on the following national technical standards and its updates established by People's Republic of China Ministry of Agriculture:

Standard No.	Standard Name
NY/T 1220.1-2006	Technical code for biogas engineering-Part 1: Process design
NY/T 1220.2-2006	Technical code for biogas engineering-Part 2: Design of biogas supply
NY/T 1220.3-2006	Technical code for biogas engineering-Part 3: Construction and acceptance
NY/T 1220.4-2006	Technical code for biogas engineering-Part 4: Operation and maintenance
NY/T 1220.5-2006	Technical code for biogas engineering-Part 5: Evaluation of quality
NY/T 1221-2006	Technical specification for operation maintenance and safety of biogas plant in scale animal and poultry farms
NY/T 1222-2006	Criteria for designing of biogas plant in scale animal and poultry breeding farms
NY/T 1223-2006	Biogas-powered generating sets
GB/T 3606-2001	National Standards of China for Domestic Biogas Stove
DL/T448-2000	Technical Administrative Code of Electric Energy Metering

All main equipments in the Programme will be domestically produced. The PoA does not require any technology transfer from Annex-I countries to the host country.

A.7. Public funding of PoA

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

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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The additionality for the PoA has been demonstrated as the following four parts:

(i)<u>The proposed PoA is a voluntary coordinated action;</u>

The PoA is a scheme developed by Beijing Huayu Xinda Consultation Co., Ltd. (the CME) to promote the building of biogas digester system and biogas recovery system in livestock farms in Anhui Province, Jiangsu Province and Yunnan Province. At Present, there is no mandatory law to enforce livestock

farmers to install animal manure treatment system with recovery and utilization of biogas. Therefore, this PoA is not implementing any mandatory policy or regulation of China.

The Confirmation that the proposed PoA is a voluntary action by the CME is based on the statement dated 05/06/2012. In addition, The China LOA was also confirmed that Beijing Huayu Xinda Consultation Co., Ltd. was authorized as China's participant to voluntarily participated in and carry out the PoA as the Coordinating/Managing Entity.

(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 Anhui, Yunnan and Jiangsu 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. At Present, there is no mandatory law to enforce livestock farms to install animal manure treatment system with recovery of biogas and also no law to forbid fossil fuel (including fossil fuel-based electricity) energy in China. Therefore, the CME confirms that the proposed PoA is a voluntary action by the owners of the livestock farms.

C. Each CPA included into the PoA is additional.

According to paragraph 7 of EB 65 annex3, additionality shall be demonstrated by establishing that in the absence of CDM, none of the implemented CPAs would occur which mean that the additionality of the proposed PoA will be demonstrated on the CPA level.

The proposed PoA, which consist of one or more small-scale projects as CPAs, have included eligibility criteria (7) derived from all the relevant requirements of the "*Guidelines for demonstrating additionality of microscale project activities*" or "*Guidelines on the demonstration of additionality of small-scale project activities*".*activities*" According to the eligibility criteria (7), the CPAs are additional if they can satisfy any one of the following approaches:

Approach (I) Meets relevant requirements in paragraph 2(a) and paragraph 4(a) of the *Guidelines for demonstrating additionality of microscale project activities*, including:

✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;

✓ The total installed capacity of the CPA is no more than 15MW_{ther};

✓ The emission reductions from type III components of the CPA are no more than 20 ktCO_2e per year;

Approach (II) Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in Paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including:

✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);

✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year;

✓ The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$

Approach (III) The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per the Paragraph 1(a) of the "Guidelines on the demonstration of additionality of small-scale project activities".

Therefore, CPAs included in the PoA are additional and the PoA is additional.

(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 livestock farmers to install animal manure treatment system with recovery and utilization of biogas currently in China.

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

Not applicable as there is no mandatory law to enforce livestock farmers to install animal manure treatment system with recovery and utilization of biogas currently in China.

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.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

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The criteria for inclusion of a CPA in the PoA are as below as per *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (EB65, Annex 3):

Only when the project activity meets the eligibility criteria checked by CME, the project activity can be added into the PoA.

No.	Eligibility criteria	Evidence Sample
1.	All the project activities under the CPA should be located in the boundary of the PoA, i.e. within Anhui Province or Jiangsu Province or Yunnan Province.	--FSR --Business license
2.	Each project activity owner under the CPA should sign a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
3.	Every CPA in aggregate meets the small-scale criteria and remains within those thresholds throughout the crediting period of the CPA, i.e., The emission reductions from type III components of the CPA should be equal to or less than 60,000 tCO_2e/y and the total installed/rated/added energy generation capacity of the CPA should be equal to or less than $15MW_{ele}/45\ MW_{ther}$.	--FSR or FSR approval; --Equipment brand/ nameplate; or --Equipment purchase contract; --CPA lists --ER Calculation worksheet;
4.	The proposed small-scale CPA is not a debundled component of a large scale activity, 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, if the CPA will satisfy any of the conditions below: a. Doesn't have the same activity owner as the proposed small scale CPA or doesn't have a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure;	--FSR; --Documents from local government; --Onsite Survey.

	Or b. There is no any activity 2 with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.	
5.	The start date of the project activities under the CPA, which is the earliest date among equipment purchase date, debt contract date and construction start date, are later than the PoA GSC start date (14/06/2012).	--Equipment purchasing contract --Construction contract or construction start record
6.	The PoA start date is 01/02/2013, or the submission date of the PoA, whichever is earlier, so the CPA crediting period does not exceed 31/01/2040 (the PoA end date).	--CPA-DD
7.	A CPA should meet any one of following criteria for assessing additionality: (a)Meets relevant requirements in paragraph 2(a) and paragraph 4(a) of the *Guidelines for demonstrating additionality of microscale project activities*, including: ✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country; ✓ The total installed capacity of the CPA is no more than 15MW_{ther}; ✓ The emission reductions from type III components of the CPA are no more than 20 ktCO_2e per year; (b)Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including: ✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);	--ER Calculation worksheet --Income statement --IRR Calculation worksheet

[2] 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

	✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year; ✓ The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$ (c)The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the "Guidelines on the demonstration of additionality of small-scale project activities".		
8.	The project activities under the CPAs are not sponsored by any funding from Annex I parties.		--Project approval or --Confirmation by the project owner
9.	Each project activities included in the CPA must have obtained approval of EIA.		--EIA and its approval
10.	Measures should be taken to avoid double counting of emission reductions for the CPA, like unique identifications of product and end-user locations (e.g. programme logo).		-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
11.	All the project activities under the CPA are to install new anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered biogas.		-- FSR or FSR approval; --Technical flow figure
12.	The CPA complies with applicability and other requirements of applied methodologies. 1)All relevant applicability criteria of methodology AMS-III.D shall be met; detailed analysis is conducted in section B.2 of Part II of PoA-DD. 2)Regarding the renewable part, there are four scenarios for energy generation involved in the PoA as follows:		--On-site photo or --FSR or FSR approval --EIA or EIA approval --History Record of livestock farms --Statement by Related Agriculture Bureau --Technical demonstration --Official data at the nearest meteorological station, or -- Data available from historical on site observations
12.1	***Scenario I*** The biogas produced by the project	The CPA under scenario I will satisfy the applicability of	

	is used for supplying thermal energy that displaces fossil fuel use for livestock farms and/or households.	Methodology AMS-I.C, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	
12.2	***Scenario II*** The biogas produced by the project is used for generating electricity for captive use that displaces electricity purchased from Power Grid.	The CPA under scenario II will satisfy the applicability of Methodology AMS-I.F, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	
12.3	***Scenario III*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and/or households and for generating electricity for captive use that displaces electricity purchased from Power Grid.	The CPA under scenario III will satisfy the applicability of Methodology AMS-I.C and AMS-I.F, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	
12.4	***Scenario IV*** The biogas produced by the project is used for generating electricity delivered to Power Grid.	The CPA under scenario IV will satisfy the applicability of Methodology AMS-I.D, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	

B.3. Application of methodologies

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The following methodologies are applied in the PoA:

AMS-III.D.:	***"Methane recovery in animal manure management systems"* (Ver 18.0);**
AMS-I.C.:	**"**Thermal energy production with or without electricity**"(Ver 19.0)**
AMS-I.D.:	***"Grid connected renewable electricity generation"* (Ver 17.0);**
AMS-I.F.:	***"Renewable electricity generation for captive use and mini-grid"* (Ver 02.0).**

For more information, please refer to:

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

Those methodologies also refer to:

AMS-III.AO.: Methane recovery through controlled anaerobic digestion (Ver 1.0)
Tool to calculate the emission factor for an electricity system (Ver 02.2.1);
Tool to determine project emissions from flaring gases containing methane (Ver 01);
Tool for the Demonstration and Assessment of Additionality (Ver 06.0.0);
Guidelines on the Assessment of Investment Analysis (Ver 05);
Guidelines for demonstrating additionality of microscale project activities (Ver 04.0);
Guidelines on the demonstration of additionality of small-scale project activities (Ver 09.0)
General Guidelines to SSC CDM methodologies (Ver 19.0);
Standard for Application of Multiple CDM Methodologies for a Programme of Activities (Ver 01.0);

For more information, please refer to:

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

As to technology / measures, for Type III component, it involve the introduction of Anaerobic Animal Manure Management Systems in livestock farms to achieve methane recovery, and for Type I component, detailed information was summarized as below according to different scenario and combination of methodologies.

Scenario No.	Description of project scenario on energy generation	Methodology Combination
I	Recovered biogas will be utilized to generate **thermal energy only** which could satisfy the heat demand of livestock farm and/or nearby residents.	AMS-III.D. + AMS-I.C.
II	Recovered biogas will be utilized to **generate electricity only**, and electricity generated will be used for **captive use.**	AMS-III.D + AMS-I.F.
III	Recovered biogas will be utilized for **thermal and power generation separately**: ➢Part of the recovered biogas will be utilized to generate **electricity** which will be consumed for **captive use.** ➢Part of the recovered biogas will be utilized to generate **thermal energy** supplied to the livestock farm and/or nearby residents.	AMS-III.D + AMS-I.F. +AMS-I.C.
IV	Recovered biogas will be utilized to **generate electricity only**, and electricity generated will be **delivered to the power grid.**	AMS-III.D + AMS-I.D.

According to methodologies above, each of them is approved for use in a PoA.

SECTION C. Management system

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In order to implement the PoA smoothly, an operational and management plan was established by the CME, which is presented as below:

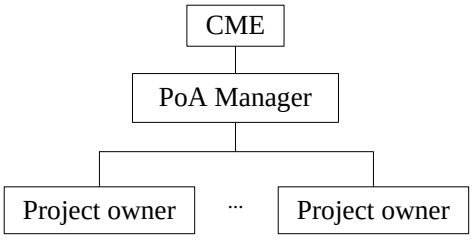


Figure 3.Operational and Management Structure

The responsibility of each entity involved in the PoA is described as the below table:

Entity	Responsibility description
PoA Manager of CME	CME is in full charge of overall management and coordination of the PoA. The details responsibility of CME mainly includes: (1) Track the development of PoA; keep communication with EB, DNA and related agencies; (2) Establish the monitoring plan and training plan; (3) Manage the contracts between CME and project owner, and other documents;

	(4) Take in charge of the PoA database establishing and updating and managing; (5) Conduct the double counting checking; (6) Conduct CPA inclusion (eligible check) as well as database updating and management; (7) Taking in charge of monitoring data analysis and archiving; (8) Furthermore, to manage the PoA more efficiently and smoothly, a specialized team will be designated by the CME for improvement of operation and management of the PoA. This specialized team will mainly take in charge of the following matters: -Regular on-site check regarding operation of biogas systems; -Based on on-site check, identify the opportunity to improve the operation and management plan; -Discuss with CME and farm owner and related technical staff about feasibility of improvement action; -Implement improvement plan;
Project owner	Take in charge of operation and management of project activity, as well as assist PoA manager to conduct monitoring plan according to *Management and Monitoring Manual*.

(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 project activity under the CPA has a unique number as well. The CME will establish a database for records of each project activity under of the CPAs included in the PoA. The project CDM team will keep a record of the monitoring data, monthly aggregate and summarize as electronic edition and deliver to the CME's database system. The operation and management plan and recording keeping system developed is described as follows.

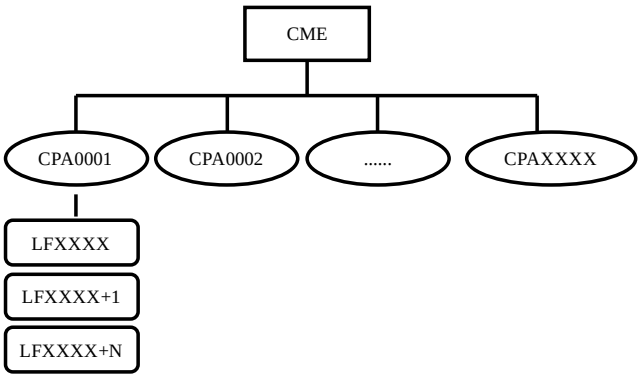
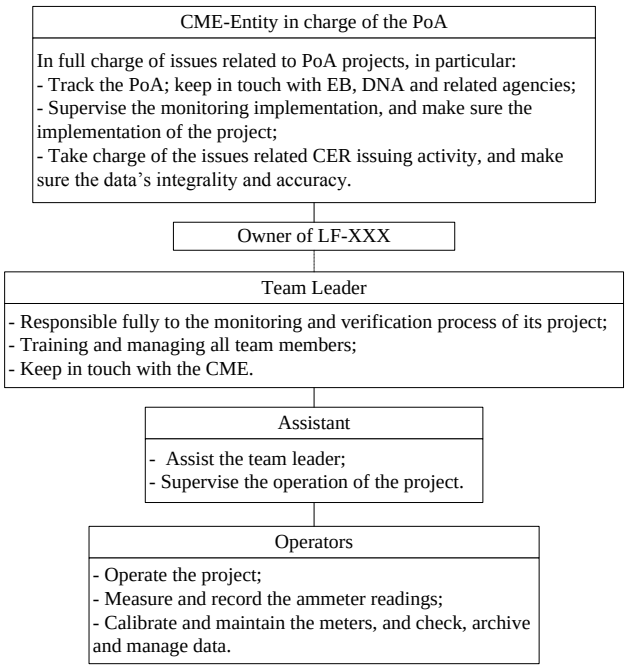


Figure 4.Record keeping system of the PoA

The monitoring team including a team leader, an assistant, and at least two operators, will be designated by the project activity owner. 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 CME. The maintenance of the system and related equipments is

accomplished by an outsourced company with the help of the operators. The monitoring structure is shown as follows:



Hard copy documentations, such as Environmental Impact Assessment and Flexibility Study Report, will be collected in a central place, together with *Management and Monitoring Manual*. 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.

(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 the project activity(ies) 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 activity to ensure that any project activity in a new CPA has neither already been registered as a CDM project, nor as a CPA of another PoA. By measures above, double accounting can be avoided.

(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*, a proposed small scale CPA of a PoA 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 owner as the proposed small scale CPA or has a 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.*

The CME will check the project activities under the new CPA according to the guideline mentioned above by the database (including the detail information of the project activities, e.g. geographic coordinates) established by the CME. Moreover, 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.

According to the Number (4) of the eligibility criteria for inclusion of a CPA in the PoA, the CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

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

Contracts will be signed between the CME and the project 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 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.

SECTION D. Duration of PoA

D.1. Start date of PoA

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01/02/2013, or the registration date of the PoA, whichever is earlier.

D.2. Length of the PoA

>>

28 years

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

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

According to the "National Environmental Impact Assessment Law", EIA is required for each construction project, and the EIA of this project type should be conducted on project level, Therefore, The EIA will be undertaken at CPA level based on the EIA of each activity in the CPA.

E.2. Analysis of the environmental impacts

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

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

>>

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

The stakeholder consultation was done at PoA level base on the following reasons: 1) Because the PoA is an integrative programme, to acquire the stakeholders's comments at the PoA level would lead to a more

direct and comprehensive understanding of the PoA; 2) According to relevant guidance, unlimited number of CPAs can be included in a PoA, therefore, it is not reasonable to do the consultation at CPA level; 3) Similar technologies are used in the CPAs under the PoA, and similar influences will be produced, so there is no need to do the consultation for each CPA. Therefore, it's reasonable to do the stakeholders' questionnaires at the PoA level.

To ensure the sustainability of the PoA, the CME of the PoA have carried out a stakeholders' consultation process around Anhui Province, Jiangsu Province and Yunnan Province. The whole process is summarized as below:

1.Notification

The bulletins of the stakeholder consultation of the proposed PoA were done by CME during 04/2012 to 05/2012, which contained the brief introduction of the PoA, the social impact of these PoA, the introduction of CDM/POA, and the contact way for raising comments and getting the questionnaire. The bulletin posted near the residents' living areas and some public places in each involved city of Anhui Province, Jiangsu Province and Yunnan Province. The questionnaires were delivered to local residents by the CME with the support of Local Rural Energy Office and also can be got by the residents themselves from the Local Rural Energy Office.

2.Questionnaire campaign

450 questionnaires (10 copies for each city) were distributed among Anhui Province, Jiangsu Province and Yunnan Province, and 100% was returned. The respondents are representative in terms of gender, age, occupation and education, so their attitude towards the impacts of the PoA can therefore be seen as a comprehensive reflection of the attitudes of the residents possibly affected by the project.

The questions in the questionnaires include:
1)The overall attitudes to the PoA;
2)Local economic impact of the PoA;
3)Local income and life quality impact of the PoA;
4)Local new job opportunity impact of the PoA;
5)Local ecological impact of the PoA;
6)The possible negative impact to the local area;
7)Any other comments and suggestions.

F.2. Summary of comments received

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Based on the returned questionnaires, the comments are summarized as below:

1) All respondents are in favor of the PoA, no respondent stated objection;

2) 436 respondents (96.9%) think the projects under the PoA can bring positive impacts to local economic development; 14 respondents (3.1%) think the projects under the PoA have no impacts on local economic;

3) 421 respondents (93.6%) believe the projects under the PoA will help to improve the income and life quality of local residents; 29 respondents (6.4%) think the projects under the PoA have no impacts on income and life quality of local residents;

4) 434 respondents (96.4%) believe the projects under the PoA can provide new job opportunity; 16 respondents (3.6%) think the projects under the PoA have no impacts on new job opportunity;

5) 450 respondents (100%) believe the projects under the PoA will do not put negative impact on

local ecological environment;

6) No respondent offers any suggestion regarding the negative impacts of the projects under the PoA.

F.3. Report on consideration of comments received

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All comments from the local residents will be seriously considered, and the returned questionnaires show that the PoA is supported by local residents and will bring various positive impacts to the local area.

SECTION G. Approval and authorization

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The Letter of Approval (LoA) from China (No.4826, November, 2012) is available at the time of submitting the PoA-DD to the validation Doe.

As per Point 1 of the LoA, China approved the Kyoto Protocol to the United Nations Framework Convention on Climate Change on 30 August 2002, and is a Party to the Kyoto Protocol.

As per Point 3 of the LoA, Beijing Huayu Xinda Consultation Co., Ltd. is authorized as the China's participant to voluntarily participate in and carry out the PoA as the CME.

PART II. Generic component project activity (CPA)

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The stated goal of the proposed PoA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for **energy generation**. There are **four scenarios for energy generation** involved in the PoA as follows:

Scenario No.	Description of project scenario on energy generation	Baseline scenario		Methodology Combination
		Type III (Methane avoidance)	Type I (Energy Generation)	
I	Recovered biogas will be utilized to generate **thermal energy only** which could satisfy the heat demand of livestock farm and/or nearby residents.	Animal manure would be left to decay anaerobically without methane recovery and destruction.	Equivalent amount of thermal energy would be generated based on fossil fuel.	AMS-III.D. + AMS-I.C.
II	Recovered biogas will be utilized to **generate electricity only**, and electricity generated will be used for **captive use.**	Animal manure would be left to decay anaerobically without methane recovery and destruction.	Equivalent amount of power energy would be provided by fossil fuel based power grid.	AMS-III.D + AMS-I.F.
III	Recovered biogas will be utilized for **thermal and power generation separately**: ➢Part of the recovered biogas will be utilized to generate **electricity** which will be consumed for **captive use.** ➢Part of the recovered biogas will be utilized to generate **thermal energy** supplied to the livestock farm and/or nearby residents.	Animal manure would be left to decay anaerobically without methane recovery and destruction.	➢Equivalent amount of power energy would be provided by fossil fuel based power grid. ➢Equivalent amount of thermal energy would be generated based on fossil fuel.	AMS-III.D + AMS-I.F. +AMS-I.C.
IV	Recovered biogas will be utilized to **generate electricity only**, and electricity generated will be **delivered to the power grid.**	Animal manure would be left to decay anaerobically without methane recovery and destruction.	Equivalent amount of power energy would be provided by fossil fuel based power grid.	AMS-III.D + AMS-I.D.

This Part I is for the project activities that follow the Scenario I.

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The purpose of the CPA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for **thermal energy only** which could satisfy the heat demand of livestock farm and/or nearby residents.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The following methodologies are applied in the PoA:

AMS-III.D.:	***"Methane recovery in animal manure management systems"* (Ver 18.0);**
AMS-I.C.:	***"Thermal energy production with or without electricity" (Ver 19.0).***

For more information, please refer to:

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

Those methodologies also refer to:

AMS-III.AO.: Methane recovery through controlled anaerobic digestion (Ver 1.0)
Tool to calculate the emission factor for an electricity system (Ver 02.2.1);
Tool to determine project emissions from flaring gases containing methane (Ver 01);
Tool for the Demonstration and Assessment of Additionality (Ver 06.0.0);
Guidelines on the Assessment of Investment Analysis (Ver 05);
Guidelines for demonstrating additionality of microscale project activities (Ver 04.0);
Guidelines on the demonstration of additionality of small-scale project activities (Ver 09.0)
General Guidelines to SSC CDM methodologies (Ver 19.0);
Standard for Application of Multiple CDM Methodologies for a Programme of Activities (Ver 01.0);

For more information, please refer to:

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

According to methodologies above, each of them is approved for use in a PoA.

B.2. Application of methodology(ies)

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1.Methodology of type III --- manure treatment and avoid methane emission part

The project activities under the CPA of the PoA meet the applicability criteria of Methodology **AMS-III.D**. The details analysis on the applicability criteria of Methodology **AMS-III.D** is as the following table:

No.	Applicability Conditions as per AMS-III.D	Situation of a CPA under the PoA
1	The livestock population in the farm is managed under confined conditions;	The livestock in the Project Farm will be all managed under confined conditions, which can be confirmed through onsite check.
2	Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise AMS-III.H "Methane recovery in wastewater treatment" shall be applied;	Waste residue and liquid after treatment will be used as fertilizers, and therefore will not be 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;	According to the document or information of nearby meteorology bureau, the annual average temperature of baseline site will higher than 5°C.
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;	The manure waste is left to decay in the anaerobic lagoon. According to the size of anaerobic lagoons and daily amount of manure, it can be known the retention time of manure waste in the anaerobic treatment system; the depths of lagoon can be known based on the onsite check or the supporting documents provided by the third party, e.g. construction drawing of lagoon.
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	In the baseline scenario, methane from the lagoon will be directly released into atmosphere without any recovery, destruction or utilization activity through the onsite check or the supporting documents provided by the third party.
6	The residual waste from the animal manure management system 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 of the project will be handled aerobically and utilized as fertilizer, which will not result in methane emissions.
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	Biogas tank will be installed in each project activity to achieve that in case of emergency all methane produced from anaerobic digestion can be stored but not emitted to atmosphere, and

		therefore ensure that all methane produced by the digester is destroyed.
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 digester. 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.	Manure collected will be cleaned and transferred into the anaerobic digesters as soon as possible, which usually does not exceed one day.
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".	The project activities under the CPA do not involve landfill methane recovery, wastewater treatment, composting animal manure, or co-digestion of animal manure and other organic matters; therefore this is irrelevant.
10	Different options to utilise 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.	The recovered biogas will be used for generation of thermal, which belongs to option (a).
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".	Each project activity under the CPA is a newly built animal manure treatment system and they can meet the related and relevant requirements in the "*General Guidelines to SSC CDM methodologies*". The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "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".	Each project activity under the CPA is a newly built animal manure treatment system, thus this criterion is not relevant as replacement of equipment is not involved in a CPA under the PoA.
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.	The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "General Guidelines to SSC CDM methodologies".

Based on analysis above, AMS-III.D is applicable to the CPAs under the PoA.

2.Methodology of type I --- renewable energy part

The details analysis on the applicability criteria of Methodology **AMS-I.C.** is as the following table:

No.	Applicability Conditions as per AMS-I.C	Situation of this Project Activity
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.	The project activities under CPA will use the biogas collected from the anaerobic manure management system to generate thermal energy that displaces the fossil fuel.
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. Cogeneration system may supply one of the following: (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).	N/A Co-generating systems is not involved in a CPA.
3	Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (a)Electricity supply to a grid; (b)Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (c)Combination of (a) and (b).	N/A Co-generating systems is not involved in a CPA.
4	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	The total installed capacity of each CPA under the PoA is less than 45 MW thermal.
5	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.	N/A This criterion is not relevant because each project activity under the CPA is heat generation based on biogas-fired. Co-fired systems are not involved in a CPA.
6	The following capacity limits apply for biomass cogeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of	N/A Co-generating systems is not involved in a CPA.

	the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e., for renewable project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e., no emission reductions accrue from electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e., no emission reductions accrue from thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	
7	The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities 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 comply with capacity limits in paragraphs 4 to 6, and should be physically distinct[3] from the existing units.	N/A The proposal for the CPA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
8	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	N/A The proposal for the CPA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
9	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"	According to AMS-I.C as well as "General Guidelines to SSC CDM methodologies" and AMS-III.D, the total installed capacity of the CPA (for electricity capacity, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM

[3] Physically distinct units are those that are capable of producing thermal/electrical energy without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

		methodologies") is no more than 45$MW_{th.}$
10	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.	N/A The solid biomass fuel (e.g. briquette) is not involved in the CPA.
11	Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	N/A The solid biomass fuel (e.g. briquette) is not involved in the CPA.
12	In case electricity and/or steam/heat 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 energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displaced.	The supplier will sign contract with consumers to state that, only the supplier can claim emission reductions from the energy displaced.
13	If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	N/A The type III component of a SSC methodology was adopted for the CPA.

According to analysis above, AMS-I.C. is applicable to the CPAs under the PoA.

According to Para 29(c) in Annex 3 "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (Version 01.0) of EB 65, combinations of methodologies mentioned above are eligible to be adopted in the PoA.

In conclusion, different combinations of methodologies will be used in the PoA according to the CPA scenario.

B.3. Sources and GHGs

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As per Methodology AMS-III.D, AMS-I.C, 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.

Emissions sources included in or excluded from the project boundary are shown in the following Table.

Table 1.The emission source and the category of GHG

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the waste 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	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity generation	CO_2	Excluded	The CPA is not involved electricity generation.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	**CO_2**	**Included/Excluded**	**Determined by the project owner under the CPA**
		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	CO_2 emissions from the decomposition of organic waste are not accounted
		N_2O	Excluded	Excluded for simplification.
	Emissions from flaring or combustion of the gas stream	CO_2	Excluded	Excluded for simplification.
		CH_4	**Included**	**The major source of emissions in case flaring is involved.**
		N_2O	Excluded	Excluded for simplification.
	Emissions from the use of fossil fuel or electricity	**CO_2**	**Included**	**The major source of emissions.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from incremental transportation distances	**CO_2**	**Included**	**In case of incremental transportation was occurred compared with project scenario and baseline scenario, This emissions are accounted.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from the storage of manure before being fed into the anaerobic digester	**CH_4**	**Included**	**This source of emissions 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%.**

		CO_2	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.

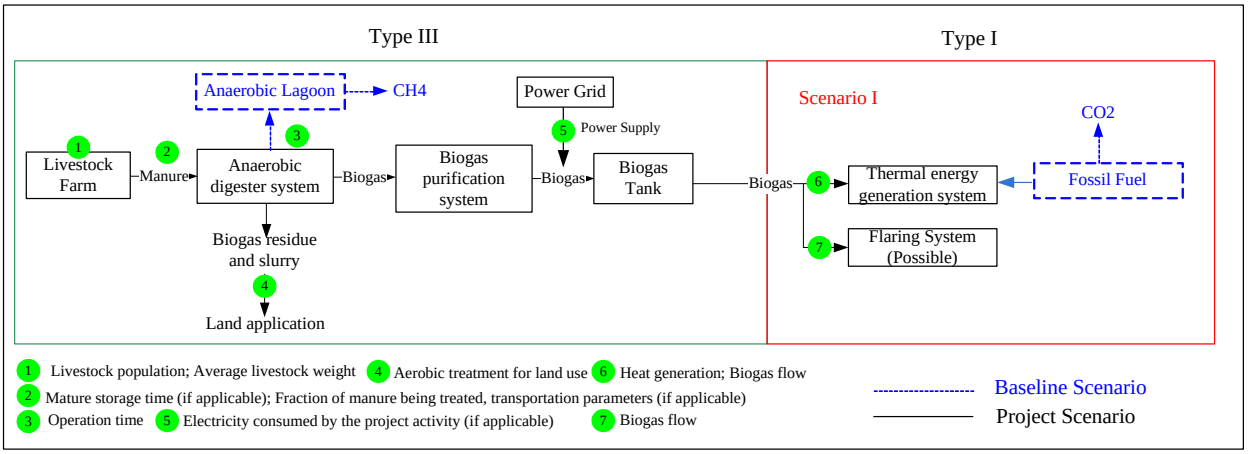

Figure 5.Project boundary

B.4. Description of baseline scenario

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1.Methodology of type III --- manure treatment and avoid methane emission part

As per AMS-III.D., 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.

2.Methodology of type I --- renewable energy part

As per AMS-I.C, 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.

Therefore, it can be concluded from above that, the baseline scenario for a CPA is that, animal manure is treated anaerobically without methane recovery and destruction, and the equivalent thermal energy is generated based on coal.

B.5. Demonstration of eligibility for a generic CPA

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The CPA is eligible for inclusion in the PoA because it meets all of the criteria outlined in section B.2 of Part I of PoA-DD:

No.	Eligibility criteria	Situation of CPA	Evidence Sample
1.	All the project activities under the CPA should be located in the boundary of the PoA, i.e. within Anhui Province or Jiangsu Province or Yunnan Province.	The livestock farms included in the CPA are located in XXX, XXX respectively, which are within Anhui Province or Jiangsu Province or Yunnan Province.	--FSR --Business license
2.	Each project activity owner under the CPA should sign a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	The potential individual project owner included in the proposed CPA has/will signed a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
3.	Every CPA in aggregate meets the small-scale criteria and remains within those thresholds throughout the crediting period of the CPA, i.e., The emission reductions from type III components of the CPA should be equal to or less than 60,000 tCO_2e/y and the total installed/rated/added energy generation capacity of the CPA should be equal to or less than $15MW_{ele}/45\ MW_{ther}$.	In the CPA, the emission reductions from type III components is XXX tCO_2/y, which is no more than 60,000 tCO_2/y, and the total installed/rated energy generation capacity of the project equipment is XX MW_{ele}/MW_{ther}, less than $15MW_{ele}/45\ MW_{ther.}$	--FSR or FSR approval; --Equipment brand/ nameplate; or --Equipment purchase contract; --CPA lists --ER Calculation worksheet;
4.	The proposed small-scale CPA is not a debundled component of a large scale activity, 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, if the CPA will satisfy any of the conditions below: (a)Doesn't have the same activity owner as the	The proposed small-scale CPA cannot satisfy the following criteria at the same time： (a)Has the same activity owner as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology and. measure; (b)The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the cloest	--FSR; --Documents from local government; --Onsite Survey.

	proposed small scale CPA or doesn't have a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure Or (b)There is no any activity[4] with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.	point. Therefore, the CPA is not a de-bundled component of a large activity;	
5.	The start date of the project activities under the CPA, which is the earliest date among equipment purchase date, debt contract date and construction start date, are later than the PoA GSC start date (14/06/2012).	The starting date of the CPA is decided by the starting date of each project activity included. The project activities' starting date are expected to be DD/MM/YYYY, which are after the GSP date, so it can be met.	--Equipment purchasing contract --Construction contract or construction start record
6.	The PoA start date is 01/02/2013, or the submission date of the PoA, whichever is earlier, so the CPA crediting period does not exceed 31/01/2040 (the PoA end date).	The end date of CPA crediting period is DD/MM/YYYY, which does not exceed the PoA end date.	--CPA-DD
7.	A CPA should meet any one of following criteria for assessing additionality: (a)Meets relevant requirements in paragraph 2(a) and paragraph 4(a) of the *Guidelines for demonstrating additionality of microscale project activities*, including: ✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;country ✓ The total installed capacity of the CPA is no more than 15MW_{ther}; ✓The emission reductions from type III	The CPA meet the criterion (a/b/c) as described in the section B.5 below.	--ER Calculation worksheet --Income statement --IRR Calculation worksheet

[4] 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

	components of the CPA are no more than 20 $ktCO_2e$ per year; (b) Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including: ✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs); ✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year; ✓ The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$ (c) The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.		
8.	The project activities under the CPAs are not sponsored by any funding from Annex I parties.	No public funding from Annex I parties have been provided.	--Project approval or --Confirmation by the project owner
9.	Each project activities included in the CPA must	Each project activities included in the CPA have	--EIA and its approval

	have obtained approval of EIA.		obtained approval of EIA.	
10.	Measures should be taken to avoid double counting of emission reductions for the CPA, like unique identifications of product and end-user locations (e.g. programme logo).		Each CPA and project activity have a unique identification as CPAXXXX and LFXXXX, and also, programme logo will be used to uniquely identify the product and end-user locations;	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
11.	All the project activities under the CPA are to install new anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered biogas.		All activities under the CPA are to install new anaerobic reactors in livestock farms to achieve methane recovery and utilization.	-- FSR or FSR approval; --Technical flow figure
12.	The CPA complies with applicability and other requirements of applied methodologies. All relevant applicability criteria of methodology AMS-III.D shall be met; detailed analysis is conducted in section B.2 of Part II of PoA-DD. There are four scenarios for energy generation involved in the PoA as follows:		The applicability criteria of methodology AMS-III.D are met.	--On-site photo or --FSR or FSR approval --EIA or EIA approval --History Record of livestock farms --Statement by Related Agriculture Bureau --Technical demonstration --Official data at the nearest meteorological station, or -- Data available from historical on site observations
12.1	***Scenario I*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households...	The CPA under scenario I will satisfy the applicability of Methodology AMS-I.C, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	The CPA is following ***Scenario I and*** the applicability criteria of methodology AMS-I.C are met.	

12.2	***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 satisfy the applicability of Methodology AMS-I.F, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	
12.3	***Scenario III*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households..and for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario III will satisfy the applicability of Methodology AMS-I.C and AMS-I.F, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	
12.4	***Scenario IV*** The biogas produced by the project is used for generating electricity delivered to the national or a regional grid.	The CPA under scenario IV will satisfy the applicability of Methodology AMS-I.D, detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	

Additionality

Considering CDM before the construction of 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 (GSC date).

To demonstrate the additionality of each CPA, timeline of the main events involved in the implementation of each CPA will be stated to prove that the project owner took CDM into serious consideration before commencing the CPA. And the project owners have taken successive actions to secure the CDM application before the construction works for the CPA.

Additionality demonstration of the CPA

According to eligibility criteria (7) for inclusion of a SSC-CPA in the PoA described in the Section B.2, the activity included in the proposed CPA could be proved additional via any of the following three approaches, and the CPA could be proved additional only if all the activities included are additional.

1. **Meets relevant requirement in** in paragraph 2(a) and paragraph 4(a) of the **"*Guidelines for demonstrating additionality of microscale project activities*", including:**
   a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country;
   b) The total installed capacity of the CPA is no more than $15MW_{th}$ (for electricity generation, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM methodologies", then the total thermal installed capacity should meet this criteria);
   c) The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year.
2. **Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in** paragraph 2(c) of the **"*Guidelines on the demonstration of additionality of small-scale project activities*", including:**
   a) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);
   b) The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year;
   c) The installed capacity of each unit in the activities included in the CPA is less than 2,250 $KW_{th.}$
3. **The third method (Meets relevant requirement in "*General Guidelines to SSC CDM methodologies*", which also refer to "*Tool for the Demonstration and Assessment of Additionality" and "Guidelines on the Assessment of Investment Analysis",* including):**
   The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.

The additionality demonstration of each approach is as follows:

Approach (1)

According to paragraph 2(a) and paragraph 4(a) of the "*Guidelines for demonstrating additionality of microscale project activities*", Project activities up to five megawatts (or 15 MW_{th}) that employ renewable energy technology for Type 1, and up to 20,000 tCO_2e of annual emission reduction for Type III projects could be determined as additional directly.

Thus, the following table are applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the CPA under the PoA	Real situation of the CPA	Applicable? (Y/N)
1	The total installed capacity of the project is no more than $5MW_e$ ($15MW_{thermal}$). ($5MW_e \times 3$, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM Methodologies")	The total installed capacity of the CPA is no more than $5MW_e$ ($15MW_{thermal}$).		
2	The emission reductions from type III components of the project is no more than 20 $ktCO_2e$ per year .	The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year		
3	The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country.	The geographic location of the projects in the CPA is in a special underdeveloped zone of the P.R. China identified by the Government via any one of the following methods: a)The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50% calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; b)The GNI per capita in		

		the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures which is calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; c)Based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by EB of the CDM and published on the UNFCCC website.		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (2)

According to paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds.

According to CPA Eligibility criteria 3, the installed capacity and project size of all the activities included in the CPA are below the limitation of small-scale CDM projects. Thus, the following table is applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the activity in the CPA under the PoA	Real situation of the activity in the CPA	Applicable? (Y/N)
1	Project activities solely	All the equipment units		

	composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs)	in the activity is solely isolated where the users are households or communities or Small and Medium Enterprises (SMEs)		
2	the size of each unit is no larger than 5% of the small-scale CDM	-The installed capacity of each unit for the Type I measure that employ renewable energy technology is no larger than 2.25MW (thermal); -The annual emission reduction of each unit for the Type III measure is no larger than 3,000 tCO_2e (thermal).		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (3)

According to the "*Guidelines on the demonstration of additionality of small-scale project activities*", following methods could be used for the demonstration of additionality:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The CPA is additional only if all the projects under the CPA are proved to be additional according to the paragraph 1(a) of "*Guidelines on the demonstration of additionality of small-scale project activities*":

Investment Barrier

Investment barrier analysis will be applied for all the projects under the CPA. The following steps in the "*Tool for the Demonstration and Assessment of Additionality*" will be applied:

Step 1 Determine appropriate analysis method

Step 2 Determine the benchmark

Step 3 Calculation and comparison of financial indicators

Step 4 Sensitivity analysis

Substep 1 Determine appropriate analysis method

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

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

Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. However, the project scenario of each CPA has more output service than the baseline scenario, thus they are not comparable. Therefore, the investment comparison analysis is not preferable.

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

Substep 2 Determine the benchmark

The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming. Only the CPA financial indicator is better than or equivalent to the benchmark, the project is economic attractive or financially feasible.

Substep 3 Calculation and comparison of financial indicators

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

Table 2.Financial Parameters of the CPA

No.	Parameter	Value	Units	Source
1	Static total investment		10,000RMB	
2	Total biogas generation		10,000m^3/year	
3	Annual total revenue		10,000RMB	
4	Project lifetime (include construction period)		years	
5	Annual O&M cost		10,000RMB	
6	Rate of VAT		%	
7	Rate of income tax		%	
8	Rate of city maintenance and construction tax		%	
9	Rate of education fee addition		%	
10	Annual CERs (emission reduction)		tCO_2e	
11	CERs price		EUR/tCO_2e	
12	Benchmark		%	

Generally values that were applied at the moment of the investment decision shall be used for the analysis above. Mostly, the Feasibility Study Report will be widely used in China.

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

Farm No.	IRR without CDM revenue	IRR with CDM revenue
LF0001		
……		
LFXXXX		

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 additional revenue is lower than the benchmark.

According to "Guidelines 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:

1)Static total investment
2)Annual revenue
- Annual biogas output
- Biogas sale price (incl. VAT)
- Annual power output
- Electricity purchase price (incl. VAT)
- Coal saving
- Coal price (incl. VAT)

3)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 four indicators varied in the range of -10%-+10%.

Table 3.Sensitivity analysis

	-10%	-5%	0%	5%	10%
Static total investment					
Annual revenue					
1)Annual biogas output					
2)Biogas sale price (incl. VAT)					
3)Annual power output					
4)Electricity purchase price (incl. VAT)					
5)Coal saving					
6)Coal price (incl. VAT)					
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.

Critical Analysis

LF0001	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	
LFXXXX	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	

Therefore, each activity in the CPA and the whole CPA is additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

I. Calculate baseline emissions

Baseline emissions of the project include baseline emissions from methane and CO_2 emissions from energy generation in the absence of the CPA. Thus, the baseline emission is calculated as follows:

$$BE_y = BE_{CH4,y} + BE_{Thermal,y} \quad (1\text{-}1)$$

Where:

BE_y Baseline emissions in year y (tCO_2e)

$BE_{CH4,y}$ Baseline emissions due to methane recovery in year y (tCO_2e)

$BE_{Thermal,y}$ Baseline emissions from thermal generation in year y (tCO_2e)

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

According to AMS-III.D, paragraph 9, $BE_{CH4,y}$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 9(a) is adopted in a CPA, which is as below:

$$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \quad (1\text{-}2)$$

Where:

$BE_{CH4,y}$ Baseline emissions due to biogas recovery in year *y* (tCO_2e)

GWP_{CH4} Global Warming Potential (GWP) of CH_4 (21)

D_{CH4} CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) 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)[5]

Determination of $B_{0,LT}$

According to AMS-III.D, 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 source. Since 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.

In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. The preferred method to obtain *VS* is to use data from nationally published sources. These values shall be compared with IPCC default values and any significant differences shall be explained. If data from nationally published sources are not available, country-specific *VS* excretion rates can be estimated from feed intake levels, via the enhanced characterisation method (tier 2) described in section 10.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. If 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;

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:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \qquad (1\text{-}3)$$

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

Where:

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 the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. Alternatively, the IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used.

Since the country-specific *MCF* is unavailable, the IPCC default values will therefore be adopted in the 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 observation.

Determination of $N_{LT,y}$

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

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right) \quad (1\text{-}4)$$

Where:

$N_{da,y}$ 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 $BE_{Thermal,y}$

Thermal energy generation in the PoA includes, utilizing biogas as fuel of heating equipment for thermal energy generation and supplying biogas to households or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal.

$$BE_{thermal,y,} = BE_{thermal,y,1} + BE_{thermal,y,2} \quad (1\text{-}5)$$

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 project activity using renewable biogas for households or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal during the year *y* (tCO_2e)

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

$$BE_{thermal,y,1} = [EG_{PJ,y} / \eta_{BL,thermal}] * EF_{FF,CO2} \quad (1\text{-}6)$$

Where:

$BE_{thermal,y,1}$	The baseline emissions from steam/heat displaced by the CPA during the year *y* (tCO_2)
$EG_{PJ,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
$\eta_{BL,thermal}$	Efficiency of the baseline equipment being replaced (determined as per paragraph 30)
$EF_{FF,CO2}$	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)

As per AMS-I.C., Efficiency of the baseline units (excluding cogeneration plants) shall be determined by adopting one of the following criteria (in preferential order):

(a) Highest measured operational efficiency over the full range of operating conditions of a unit with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards;
(b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, using the baseline fuel;
(c) Default efficiency of 100%.

As the data described in option (a) or (b) is not available, option (c) default efficiency of 100% is adopted.

For household or commercial applications/systems, 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 biomass stoves, gasifiers, driers, water heaters etc, the project output energy shall be estimated based on consumption of the biomass (in terms of energy quantity) times the efficiency of the project equipment. The equation below shall be used:

$$BE_{thermal,y,2} = [HG_{PJ,y} / \eta_{BL}] * EF_{FF,CO2} = \{[B_{biomass,PJ,y} * NCV_{biomass} * \eta_{PJ}] / \eta_{BL}\} * EF_{FF,CO2} \quad (1\text{-}7)$$

Where:

$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the project activity using renewable biogas for household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal 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)
η_{BL}	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
$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline (tCO_2/TJ)
$B_{biomass,PJ,y}$	The net quantity of the biogas consumed by households in year *y* (tons)
$NCV_{biomass}$	The net calorific value of the biogas (TJ/tons)

The efficiency of the biogas-fired stoves η_{PJ} is taken to be 55%. This corresponds to the efficiency requirements of biogas stoves and cookers according to the *National Standards of China for Domestic Biogas Stove (GB/T 3606-2001)*. The biogas-fired products with lower efficiency are not eligible to enter in the market. Products compliance with the National Standards is inspected during manufacturing by the certified authority. This is conservative.

According to AMS-I.C., for household or commercial applications/systems, 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 cooking stoves, gasifiers, driers, water heaters etc., efficiency of the baseline units shall be determined by adopting one of the following criteria:

(a) Highest measured operational efficiency over the full range of operating conditions of a representative sample of units with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards;

(b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications using the baseline fuel;

(c) Highest efficiency from referenced literature values or default efficiency of 100%.

As no data on this value is available, option (c) default efficiency of 100% is adopted.

II. Calculate project emissions

According to AMS-III.D, 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 ($PE_{storage,y}$)

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (1\text{-}8)$$

Where:

PE_y	Project emissions 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.AO (tCO_2e)
$PE_{storage,y}$	Emissions from the storage of manure (tCO_2e)

Determination of $PE_{PL,y}$

According to AMS-III.D, $PE_{PL,y}$ is calculated as follows:

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (1\text{-}9)$$

Where:

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

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 formulae below:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (1\text{-}10)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the biogas in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h (kg/h)
$\eta_{flare,h}$	Flare efficiency in hour h; 0 is used for this parameter. This is conservative.
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (1\text{-}11)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h; (kg/h)
$FV_{RG,h}$	Volumetric flow rate of the biogas in dry basis at normal conditions in hour h;(m^3/h)
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the biogas on dry basis in hour h; The default value of 60% will be used.
$\rho_{CH4,n}$	Density of methane at normal conditions (0.716); (kg/m^3)

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

As fossil fuel is not involved in the CPA, $PE_{power,y}$ is equivalent to project emissions from electricity consumption. According to AMS-III.D, project emissions from electricity consumption are determined as per the procedures described in AMS-I.D, which is calculated as below:

$$PE_{power,y} = EC_{ele,PJ,y} \times EF_{grid,CM,y} \quad (1\text{-}12)$$

Where:

$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the Project in year *y* (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*";

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

According to the *"Tool to calculate the emission factor for an electricity system",* The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin"(OM) and "build margin"(BM) as well as the "combined margin"(CM).

The tool provides procedures to determine the following parameters:

Parameter	Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

The following is the detailed process of calculating the baseline CO_2 emission factor of the grid which the Project connected to according to the steps provided by the *Tool to calculate the emission factor for an electricity system (*hereafter referred to as the *Tool).*

Sub-step 1. Identify the relevant electricity system.

Chinese DNA has published a delineation of the project electricity system and connected electricity system. The project physically connects through transmission and distribution lines to the East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province, the project boundary also includes power plants connected to ECPG or SCPG.

Project Location	Power gird	Local power grids
Anhui and Jiangsu Province	East China Power Grid (ECPG)	Shanghai City, Jiangsu, Zhejiang, Anhui, Fujian Province
Yunnan Province	Southern China Power Grid (SCPG)	Guangdong, Guangxi, Yunnan, Guizhou, Hainan Province

Sub-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.

Since the data of the off-grid power plants is not available, Option I is applied to calculate the operating margin and build margin emission factor.

Sub-step 3. Select a method to determine operating margin (OM).

According to the *Tool*, four methods compute the Operating Margin Emission factor can be used as follows:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of

total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. If the dispatch data is available the (c) Dispatch Data Analysis OM method should be the first methodological choice, while in case of the Project, the (a) Simple OM method is adapted with two reasons as follows:

(1)In cases where China presently the power grid dispatch and load data are unavailable as business secrets, so (b) and (c) cannot apply in the Project for calculating the Operating Margin Emission Factor ($EF_{grid,OM,y}$).

(2)In the five most recent years from 2006 to 2010, the low-cost/must run resources[6] constituted less than 50%[7] of total power generation of the grid. As a result, the simple OM method can be used to calculate the operating margin emission factor 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.

Sub-step 4. Calculate the operating margin emission factor according to the selected method.

From the *Tool to calculate the emission factor for an electricity system*, ($EF_{grid,simple,OM}$) may be calculated:

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

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.

Because the fuel consumption data is unavailable for each power plant / unit, Operation A cannot be used. At the same time 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 so Option B was the only operation can be used.

Where Option C is used, the simple OM method formula of $EF_{Grid,OM,Simple,y}$ calculation is:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \quad (1\text{-}13)$$

where:

$EF_{grid,OMsimply,y,}$ simple operating margin CO_2 emission factor in year y(tCO_2/MWh);

$FC_{i,y}$ amount of fossil fuel type i consumed in the project electricity system in year y ;

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

[6] 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.

[7] For ECPG, the ratios are 38.18%, 35.26%, 35.47%, 39.42% and 38.40% from 2006 to 2010 respectively. For SCPG, the ratios are 28.61%, 27.14%, 27.89%, 34.50% and 30.91% from 2006 to 2010 respectively.

$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ) and
EG_y	net electricity generated and delivered to the grid by power plant / unit m in year y (MWh);
i	all fossil fuel types combusted in power sources in the project electricity system in year y;
y	either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

When there exists net electricity imports from a connected electricity system within the same host country(ies):

(1) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(2) the emission factor of the exporting grid, if the specific plants are not clearly known.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2008 to 2010 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2, Chap 1, Page 1.21-1.24.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,OM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.8367** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.9489** tCO_2/MWh

Sub-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.

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 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.

The PDD choose Option 1.

According to the *Tool*, the following equation (11) is adopted to calculate $EF_{grid,BM,y}$.

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (1\text{-}14)$$

where:

$EF_{grid,BM,y}$ build margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{m,y}$ net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m power units included in the build margin;

y most recent historical year for which power generation data is available;

Consider of data availability, The Project adopted the following deviation method which was published by Chinese DNA and accepted by CDM EB[8]:

1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.

2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

(1) Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (1\text{-}15)$$

[8] http://cdm.unfccc.int/Projects/Deviations ; DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China"

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (1\text{-}16)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (1\text{-}17)$$

where:

$F_{i,j,y}$ the amount of fuel i (in a mass or volume unit) consumed by power j in year(s) y;

NCV_{ij} Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*;

$EF_{i,j,y}$ the CO_2 emission coefficient of fuel i (tCO2/GJ);

(2) Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} \quad (1\text{-}18)$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas.Adv,y}$ represents the efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (1\text{-}19)$$

Where $CAP_{Total,y}$ $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid,* the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2009 (311.5 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (237.4 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,BM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.6622** tCO_2/MWh

Yunnan Province	Southern China Power Grid (SCPG)	**0.3157** tCO_2/MWh

Sub-step 6. Calculate the combined margin emissions factor.

Based on the *Tool to calculate the emission factor for an electricity system*, the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y} \quad (1\text{-}20)$$

According to the *Tool to calculate the emission factor for an electricity system*, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.74945** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.6323** tCO_2/MWh

Determination of $PE_{transp,y}$

According to AMS-III.AO, the emissions from incremental transportation are calculated as below:

$PE_{transp,y}$

$$, = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (1\text{-}21)$$

Where:

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)

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:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k\ (AI_l-d)}) * MCF_l * B_{0_{LT}})\right] \quad (1\text{-}22)$$

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

III. Calculate Leakage emissions

No energy generating equipment is transferred from outside the boundary to the PoA. In addition, the collection/processing/transportation of animal manure is inside the project boundary. As per AMS-III.D., AMS-I.C. leakage can be neglected.

IV. Calculate Emission Reductions

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

$$ER_y = BE_y - PE_y \quad (1\text{-}23)$$

Where:

ER_y	Emission reductions in year *y* (tCO_2e)

According to AMS-III.D, 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 from methane recovery in any year are the lowest value of the following:

$$ER_{CH4,y,ex\,post} = \min[(BE_{CH4,y,ex\,post} - PE_{CH4,y,ex\,post}), (MD_y - PE_{power,y,ex\,post})] \quad (1\text{-}24)$$

Where:

$ER_{CH4,y,ex\ post}$	Emission reductions achieved from methane recovery based on monitored values for year *y* (tCO_2e)
$BE_{CH4,y,ex\ post}$	Baseline emissions calculated using equation 1 of AMS-III.D (for projects using option in paragraph 9 (a)) using *ex post* monitored values of $N_{LT,y}$
$PE_{CH4,y,ex\ post}$	Project emissions calculated using equation 5 of AMS-III.D using *ex-post* monitored values of $N_{LT,y}$,$MS\%_{i,y,}$ $MS\%_{l,}$ AI_l , $Q_{res\ waste,y}$ 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 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:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \quad (1\text{-}25)$$

Where:

$BG_{burnt,y}$	The amount of biogas utilized in year *y* (m^3)
$w_{CH4,y}$	Methane content in biogas in the year *y* (volume fraction)
FE	Flare efficiency of biogas utilized for energy generation in year (fraction, 100% is applied, determined by paragraph 22 of AMS-III.D)

In conclusion, emission reductions from energy generation are summarized as below:

$$ER_{y,ex\ post} = ER_{CH4,\ y,ex\ post} + BE_{thermal,\ y} \quad (1\text{-}26)$$

Where:

$ER_{y,ex\ post}$	Emission Reductions based on monitored values for year *y* (tCO_2e)
$ER_{CH4,\ y,ex\ post}$	Emission reductions achieved from methane recovery based on monitored values for year *y* (tCO_2e)
$BE_{Thermal,y}$	Baseline emissions from thermal generation in year y (tCO_2e)

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	MCF_j
Unit	%
Description	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data	IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	For the MCF value, country-specific MCF values are not available, so he IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 was used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$B_{O,LT}$
Unit	$m^3/CH_4/kg$ dm
Description	Maximum methane producing potential of the volatile solid generated for animal type "LT"
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	According to AMS-III.D, The maximum methane-producing capacity of the manure (*Bo*) varies by species and diet. Since country specific Bo 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. In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$MS\%_{Bl,j}$
Unit	%
Description	Fraction of manure handled in baseline animal manure management system "j"
Source of data	FSR
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	All manure handled in baseline animal manure management.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$W_{default}$
Unit	kg
Description	Default average animal weight of a defined population
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$VS_{default}$
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	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	IPCC default value is credible data source. In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	MCF_l
Unit	-
Description	Annual methane conversion factor for the project manure storage device *l*
Source of data	Table 10.17, Chapter 10, Volume 4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See individual CPA-DD
Choice of data or Measurement methods and procedures	According to the Methodology AMS-III.D., IPCC default value should be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$fv_{CH4,RG,h}$
Unit	-
Description	Volumetric fraction of methane in the residual gas on dry basis in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	60%
Choice of data or Measurement methods and procedures	A default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$w_{CH4,y}$
Unit	-
Description	Methane content in biogas in the year *y*
Source of data	AMS-III.D.
Value(s) applied	60%
Choice of data or Measurement methods and procedures	According to AMS-III.D., a default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$EF_{FF,CO2}$
Unit	tCO_2/GJ
Description	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter 1, table 1.4
Value(s) applied	0.0873
Choice of data or Measurement methods and procedures	The value of Brown coal briquettes is used in the proposed PoA, as: 1)The value of Brown coal briquettes is the lowest one among all type of coal stated in the IPCC. 2)The lower limit of 95% confidence interval is adopted for more conservative. Thus, the adopted value is reasonable and conservative.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$\eta_{BL,thermal}$
Unit	-
Description	Efficiency of the baseline equipment being replaced
Source of data	AMS-I.C.
Value(s) applied	100%
Choice of data or Measurement methods and procedures	As per AMS-I.C., Efficiency of the baseline units (excluding cogeneration plants) shall be determined by adopting one of the following criteria (in preferential order): (a) Highest measured operational efficiency over the full range of operating conditions of a unit with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards; (b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, using the baseline fuel; (c) Default efficiency of 100%. As the data described in option (a) or (b) is not available, option (c) default efficiency of 100% is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{BL}
Unit	-
Description	Efficiency of the baseline equipment being replaced
Source of data	AMS-I.C.
Value(s) applied	100%
Choice of data or Measurement methods and procedures	According to AMS-I.C., for household or commercial applications/systems, 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 cooking stoves, gasifiers, driers, water heaters etc., efficiency of the baseline units shall be determined by adopting one of the following criteria: (a) Highest measured operational efficiency over the full range of operating conditions of a representative sample of units with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards; (b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications using the baseline fuel; (c) Highest efficiency from referenced literature values or default efficiency of 100%. As no data on this value is available, option (c) default efficiency of 100% is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{PJ}
Unit	-
Description	Efficiency of the biogas-fired stove.
Source of data	National Standards of China
Value(s) applied	55%
Choice of data or Measurement methods and procedures	The efficiency of the biogas-fired stoves η_{PJ} is taken to be 55 %. This corresponds to the efficiency requirements of biogas stoves and cookers according to the National Standards of China for Domestic Biogas Stove (GB/T 3606-2001). The biogas-fired products with lower efficiency are not eligible to enter in the market. Products compliance with the National Standards is inspected during manufacturing by the certified authority. This is conservative.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{flare}
Unit	-
Description	Flare efficiency in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0
Choice of data or Measurement methods and procedures	0 is used for this parameter. This is conservative.
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the flaring is involved

Data / Parameter	EF_{CO2}
Unit	tCO_2/km
Description	CO_2 emission factor from fuel use due to transportation
Source of data	Since there is no such parameter in IPCC 2006 Guidelines, thus the value in IPCC 1996 is applied
Value(s) applied	0.001011
Choice of data or Measurement methods and procedures	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the material transportation is involved

Data / Parameter	$\rho_{CH4,n}$
Unit	kg/m^3
Description	Density of methane at normal conditions
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	Tool to determine project emissions from flaring gases containing methane
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$NCV_{biomass}$
Unit	GJ/m^3
Description	The net calorific value of the biogas
Source of data	Refer to AMS-I.I
Value(s) applied	0.0215
Choice of data or Measurement methods and procedures	Refer to AMS-I.I., for biogas, use default value: 0.0215 GJ/m^3 biogas (assuming NCV of the methane: 0.0359 GJ/m^3, default methane content in biogas: 60%)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data	*China Electric Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$FC_{i,y}$
Unit	mass or volume unit
Description	Amount of fossil fuel type i consumed in the project electricity system in year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$F_{i,j,y}$

Unit	Mass or volume
Description	The fuel consumption of fuel i in power plant j during year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$NCV_{i,y}$
Unit	TJ/t, TJ/km^3
Description	Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*
Source of data	*China Energy Statistical Yearbook, 2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ (tCO_2e/TJ)
Description	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$OXID_{i,y}$
Unit	%
Description	Oxidation factor of the fuel *i* in year *y*
Source of data	*IPCC 2006 Revised Guidelines*

Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	**Internal use rate of power plant**
Unit	%
Description	The internal power consumption of power plants in year(s) *y*
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$CAP_{i, j, y}$
Unit	MW
Description	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Coal, Adv}$
Unit	%
Description	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	39.65%

Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Oil,\ Adv}$
Unit	%
Description	The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Gas,\ Adv}$
Unit	%
Description	The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the .Tool to calculate the emission factor for an electricity system.
Source of data	As per the "Tool to calculate the emission factor for an electricity system."

Value(s) applied	Official data Project Location / Power gird / $EF_{grid,CM,y}$ Anhui and Jiangsu Province / East China Power Grid (ECPG) / 0.74945 tCO_2/MWh Yunnan Province / Southern China Power Grid (SCPG) / 0.6323 tCO_2/MWh
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system."
Purpose of data	Calculation of project emissions
Additional comment	Office data

B.6.3. Ex-ante calculations of emission reductions

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The ex-ante emission reduction calculations will be done in each specific CPA-DD on the basis of the equations in section B.6.1. above and the option chosen as per the EF tool during the process of inclusion of a CPA in the PoA.

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	W_{site}
Unit	kg
Description	Average animal weight of a defined livestock population at the CPA site
Source of data	Farm Owners
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Farm owners will measure weight of livestock alive with mass scale and calculate the average in a project year.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	nd_y
Unit	day
Description	Number of days in year "y" where the animal manure management system is operational.
Source of data	Assumed 365 days in the CPA, actual data is from the measurement.
Value(s) applied	365
Measurement methods and procedures	The data is obtained from the operation records of the animal manure management system, system as the sum of operation hours.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{da,y}$
Unit	Number
Description	Number of days animal is alive in the farm in the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{p,y}$
Unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{i,y}$
Unit	%
Description	Fraction of manure handled in system *i* in year *y*
Source of data	The farm owners, all manure handled in CPA animal manure management.
Value(s) applied	The data used in the CPA is come from the farm owners, the actual data should be monitored annually based on monthly records.
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_l$
Unit	-
Description	Fraction of volatile solids (%) handled by storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	AI_l
Unit	days
Description	Annual average interval between manure collection and delivery for treatment at a given storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-treated in the year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$Q_{y,treatment}$
Unit	tonnes
Description	Quantity of compost produced in year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$CT_{y,treatment}$
Unit	tonnes/truck
Description	Average truck capacity for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$DAF_{treatment}$
Unit	km/truck
Description	Average distance for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$B_{biomass-1,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas supplied to heating equipment in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meter installed at the inlet of the heating equipment.
Monitoring frequency	-

QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$B_{biomass\text{-}2,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas consumed by households in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meters installed at the inlet of gas line network.
Monitoring frequency	
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas combusted in year "y"
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by flow meter
Monitoring frequency	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$FV_{RG,h}$
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
Source of data	Onsite measurement by flow meter
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Biogas sent to the flare will be monitored through the use of biogas flow meter continuously and reported cumulatively on weekly basis.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter will only be monitored when there is surplus gas from the Project and a flare is installed. The flow meter will undergo maintenance/calibration annually subject to appropriate industry standards by qualified entity.

Data / Parameter	P_{PJ}
Unit	Pa
Description	Pressure of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The pressure of the biogas will be recorded daily using manometer and monthly averaged.
Monitoring frequency	–
QA/QC procedures	The manometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	T_{PJ}
Unit	^oC
Description	Temperature of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The temperature of the biogas will be recorded daily using thermometer and monthly averaged.
Monitoring frequency	-

QA/QC procedures	Thermometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{PJ,y}$
Unit	TJ/yr
Description	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
Source of data	The data used in the CPA is come from the FSR, the actual data should be monitored annually based on continuous monitoring and monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The temperature, pressure and flow of steam provided by the CPA, will be measured by thermograph, flow-meter and manometer. Then the enthalpy of the steam will be determined. The net thermal energy generated by the Project will be available by the enthalpy of the steam deducting the known enthalpy of the inlet water. 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 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. In case of equipment that produces hot water/oil this is expressed as difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient.s end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient.
Monitoring frequency	The meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EC_{ele,PJ,y}$
Unit	MWh/year
Description	Quantity of net electricity consumed by the Project in year y
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Electricity meters should be installed to measure the quantity of the electricity consumed by the CPA in year y.
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	**Operation of the household biogas stoves**
Unit	-
Description	Continuous operation of the household biogas stoves
Source of data	FSR, and the actual information should be assessed
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annual check of all appliances thereof to ensure that they are still operating or are replaced by an equivalent in service appliance. In the case of household or commercial applications/systems, 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: (i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute), if necessary using survey methods; (ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

Data / Parameter	Soil application of the residue waste
Unit	-
Description	Soil application (not resulting in methane emissions) of the residual waste.
Source of data	The actual information should be assessed through onsite check
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The soil application when the final sludge used will be monitored and recorded by the project owner.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

B.7.2. Description of the monitoring plan for a generic 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 project owner is responsible for the implementation of the monitoring plan, and the consumers cooperate with the project owner.

1.Monitoring Parameters

Data/parameters needed to be monitored are listed below in the table:

No.	Data/Parameter	Description	Source of data	Record Frequency
1	W_{site}	Average animal weight of a defined livestock population at the CPA site	Farm Owners	-
2	nd_y	Number of days in year "y" where the animal manure management system is operational.	Farm Owners	-
3	$N_{da,y}$	Number of days animal is alive in the farm in the year y	Farm Owners	monthly
4	$N_{p,y}$	Number of animals produced annually of type LT for the year y	Farm Owners	monthly
5	$MS\%_{i,y}$	Fraction of manure handled in system *i* in year *y*	Farm Owners	monthly
6	$MS\%_{l}$	Fraction of volatile solids (%) handled by storage device *l*	Farm Owners	monthly
7	AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device *l*	Farm Owners	monthly
8	Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year	Farm Owners	daily
9	$Q_{y,treatment}$	Quantity of compost produced in year	Farm Owners	daily
10	CT_y	Average truck capacity for transportation	Farm Owners	monthly
11	$CT_{y,treatment}$	Average truck capacity for compost transportation	Farm Owners	monthly
12	DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation	Farm Owners	monthly
13	$DAF_{treatment}$	Average distance for compost transportation	Farm Owners	monthly
14	$B_{biomass-1,PJ,y}$	The net quantity of the biogas supplied to heating equipment in year *y*	Flow meter	Continuously
15	$B_{biomass-2,PJ,y}$	The net quantity of the biogas consumed by households in year y	Flow meter	Continuously
16	$BG_{burnt,y}$	Biogas combusted in year "y"	Flow meter	Continuously
17	$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	Flow meter	Continuously
18	P_{PJ}	Pressure of the biogas at the flow measurement site	manometer	daily
19	T_{PJ}	Temperature of the biogas at the flow measurement site	Thermometer	daily
20	$EG_{PJ,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)	Heat metering system	Continuously
21	$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the CPA in year *y*	Electricity meter.	Continuously
22	Operation of the household biogas stoves	Continuous operation of the household biogas stoves	Farm Owners	-
23	Soil application of the residue waste	Soil application (not resulting in methane emissions) of the residual waste.	Farm owners	-

For monitoring parameters, please refer to Section E.7.1.The coordinating/managing entity opts for a verification method that does not use sampling. Each CPA will be monitored and verified.

2.Monitoring organization

In order to implement the monitoring plan effectively, the specific person in charge of the CPA is designated by CME to make sure the implementation of monitoring plan and keep in touch with EB, DNA and other relevant parties. The monitoring structure is clearly shown in the following figure.

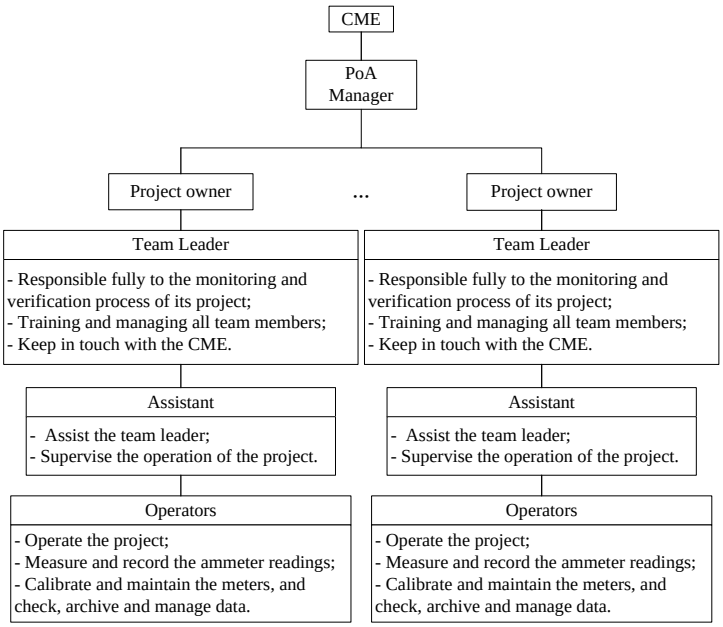

Figure 6.Monitoring team organization

Position	Responsibility description
PoA manager	PoA manager is designated by CME and is in full charge of monitoring and issues related to PoA, in particular: (1) Track the development of POA; keep communication with EB, DNA and related agencies; (2) Establish the monitoring plan and training plan. (3) Collect the data, and supervise implementation of the PoA.
Project Owner	Take in charge of operation and management of project activity, as well as assist PoA manager to conduct monitoring plan according to *Management and Monitoring Manual*.
Monitoring team	Designated by the project owner, and take in charge of monitoring implementation and the data collection according to the *Management and Monitoring Manual*.

All data will be bottom-up collected and reported as shown in monitoring structure and finally reported to CME.

This monitoring plan will be carried out by each monitoring team of each livestock farm under the

supervision of the CME, designated by the livestock farm owner, 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 such as receipts of biogas sales.

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.

3.Installation of monitoring equipments

Flow metering systems will be installed in the location 6 and 7 respectively to monitor the biogas supplied to livestock farm(s), and/or nearby residents, and if available, the flaring system; and Heat metering system will be installed in location 6 to monitor the heat generated by biogas heating equipment supplied to livestock farm(s) and/or nearby residents; if available, electricity metering system will be installed in the location 5 to monitor the electricity from power grid consumed by the project activity (ies).

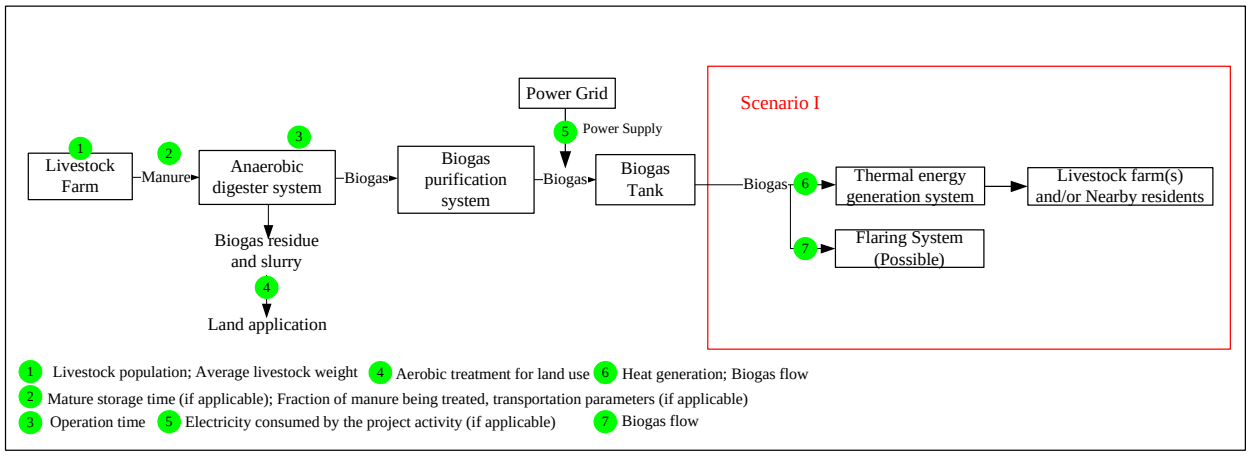

Figure 7.Monitoring system for project scenario

4.Data Collection and Management

All data continuously measured are transmitted to the CME (Each activity owner will take responsibility for data collection). The regular summary should be made and reported to technology department by statistician periodically; all the data after internal validation should be saved up to 2 years after the end of the crediting period.

5.QA/QC

Equipments 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. Once measuring equipment is in fault, it shall be replaced immediately with another calibrated

measuring equipment by a professional engineer. During the period of erroneous measurement and replacement of the fault meter, a conservative method that can cause a lower CER value will be used.

If the error of data is caused by accidents during the crediting period, the project owner(s) 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.

6.Training

Before the formal operation of each activity, the person in charge of the CPA will organize the relevant personals to participate the CDM training.

7.Verification

The verification of emission reduction is carried out based on CME's requirements. The CME should provide DOE documents and evidence related to monitoring.

This Part II is for the project activities that follow the Scenario II.

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The purpose of the CPA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for **generate electricity only**, and electricity generated will be used for **captive use**.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The following methodologies are applied in the PoA:

AMS-III.D.:	***"Methane recovery in animal manure management systems"* (Ver 18.0);**
AMS-I.F.:	***"Renewable electricity generation for captive use and mini-grid"* (Ver 02.0).**

For more information, please refer to:

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

Those methodologies also refer to:

AMS-III.AO.: Methane recovery through controlled anaerobic digestion (Ver 1.0)
Tool to calculate the emission factor for an electricity system (Ver 02.2.1);
Tool to determine project emissions from flaring gases containing methane (Ver 01);
Tool for the Demonstration and Assessment of Additionality (Ver 06.0.0);
Guidelines on the Assessment of Investment Analysis (Ver 05);
Guidelines for demonstrating additionality of microscale project activities (Ver 04.0);
Guidelines on the demonstration of additionality of small-scale project activities (Ver 09.0)
General Guidelines to SSC CDM methodologies (Ver 19.0);
Standard for Application of Multiple CDM Methodologies for a Programme of Activities (Ver 01.0);

For more information, please refer to:

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

According to methodologies above, each of them is approved for use in a PoA.

B.2. Application of methodology(ies)

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1.Methodology of type III --- manure treatment and avoid methane emission part

The project activities under the CPA of the PoA meet the applicability criteria of Methodology **AMS-III.D**. The details analysis on the applicability criteria of Methodology **AMS-III.D** is as the following table:

No.	Applicability Conditions as per AMS-III.D	Situation of a CPA under the PoA
1	The livestock population in the farm is managed under confined conditions;	The livestock in the Project Farm will be all managed under confined conditions, which can be confirmed through onsite check.
2	Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise AMS-III.H "Methane recovery in wastewater treatment" shall be applied;	Waste residue and liquid after treatment will be used as fertilizers, and therefore will not be 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;	According to the document or information of nearby meteorology bureau, the annual average temperature of baseline site will higher than 5°C.
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;	The manure waste is left to decay in the anaerobic lagoon. According to the size of anaerobic lagoons and daily amount of manure, it can be known the retention time of manure waste in the anaerobic treatment system; the depths of lagoon can be known based on the onsite check or the supporting documents provided by the third party, e.g. construction drawing of lagoon.
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	In the baseline scenario, methane from the lagoon will be directly released into atmosphere without any recovery, destruction or utilization activity through the onsite check or the supporting documents provided by the third party.
6	The residual waste from the animal manure management system 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 of the project will be handled aerobically and utilized as fertilizer, which will not result in methane emissions.
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	Biogas tank will be installed in each project activity to achieve that in case of emergency all methane produced from anaerobic digestion can be stored but not emitted to atmosphere, and

		therefore ensure that all methane produced by the digester is destroyed.
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 digester. 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.	Manure collected will be cleaned and transferred into the anaerobic digesters as soon as possible, which usually does not exceed one day.
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".	The project activities under the CPA do not involve landfill methane recovery, wastewater treatment, composting animal manure, or co-digestion of animal manure and other organic matters; therefore this is irrelevant.
10	Different options to utilise 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.	The recovered biogas will be used for generation of thermal, which belongs to option (a).
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".	Each project activity under the CPA is a newly built animal manure treatment system and they can meet the related and relevant requirements in the "*General Guidelines to SSC CDM methodologies*". The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "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".	Each project activity under the CPA is a newly built animal manure treatment system, thus this criterion is not relevant as replacement of equipment is not involved in a CPA under the PoA.
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.	The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "General Guidelines to SSC CDM methodologies".

Based on analysis above, AMS-III.D is applicable to the CPAs under the PoA.

2.Methodology of type I --- renewable energy part

The details analysis on the applicability criteria of Methodology **AMS-I.F.** is as the following table:

No.	Applicability Conditions as per AMS-I.F.	Situation of a CPA under the PoA
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.	The project activities under CPA will use the biogas collected from the anaerobic manure management system to generate electricity, and the power will be used for captive use, the electricity generated by each activity will displace electricity from the power grid.
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.	N/A This criterion is not relevant as a mini-grid is not involved in all activities included 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. According to the table 2 in the methodology, project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid), AMS-I.F can be adopted.	Electricity generated by each project activity under the CPA will be consumption for captive purpose, so it is applicable.
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	N/A This criterion is not relevant because each project activity under the CPA is power generation based on biogas-fired.

	the Project Emissions section, is greater than 4 W/m2; • 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/m2.	
5	For biomass power plants, no other biomass other than renewable biomass are to be used in the project plant.	N/A No biomass other than biogas will be used in the project activities included in a CPA of the PoA.
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).	All the project activities included in a CPA of the PoA are Greenfield plants. It belongs to the option (a).
7	In the case of project activities that involve the capacity 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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
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.	N/A This criterion is not relevant as all the project activities under the CPA are newly built plant.
9	If the unit added has both renewable and non-renewable 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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
10	Combined heat and power (co-generation) systems are not eligible under this category.	Combined heat and power (co-generation) systems is not involved in a CPA.

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.	N/A The generated electricity is used by livestock farm itself and will not be delivered to another facility or facilities within the project boundary.

According to analysis above, AMS-I.F. is applicable to the CPAs under the PoA.

According to Para 29(c) in Annex 3 "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (Version 01.0) of EB 65, combinations of methodologies mentioned above are eligible to be adopted in the PoA.

In conclusion, different combinations of methodologies will be used in the PoA according to the CPA scenario.

B.3. Sources and GHGs

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As per Methodology AMS-III.D, AMS-I.F, 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.

Furthermore, as the CPA will need to purchase electricity from Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province), the project boundary also includes power plants connected to ECPG or SCPG. Emissions sources included in or excluded from the project boundary are shown in the following Table.

Table 4.The emission source and the category of GHG

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the waste 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	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity generation	**CO_2**	**Included**	**The major source of emissions**
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	CO_2	Excluded	The CPA is not involved thermal generation.
		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	CO_2 emissions from the decomposition of organic waste are not accounted
		N_2O	Excluded	Excluded for simplification.
	Emissions from flaring or	CO_2	Excluded	Excluded for simplification.
		CH_4	**Included**	**The major source of emissions in case flaring is**

	combustion of the gas stream			**involved.**
		N_2O	Excluded	Excluded for simplification.
	Emissions from the use of fossil fuel or electricity	**CO_2**	**Included**	**The major source of emissions.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from incremental transportation distances	**CO_2**	**Included**	**In case of incremental transportation was occurred compared with project scenario and baseline scenario, This emissions are accounted.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from the storage of manure before being fed into the anaerobic digester	**CH_4**	**Included**	**This source of emissions 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%.**
		CO_2	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.

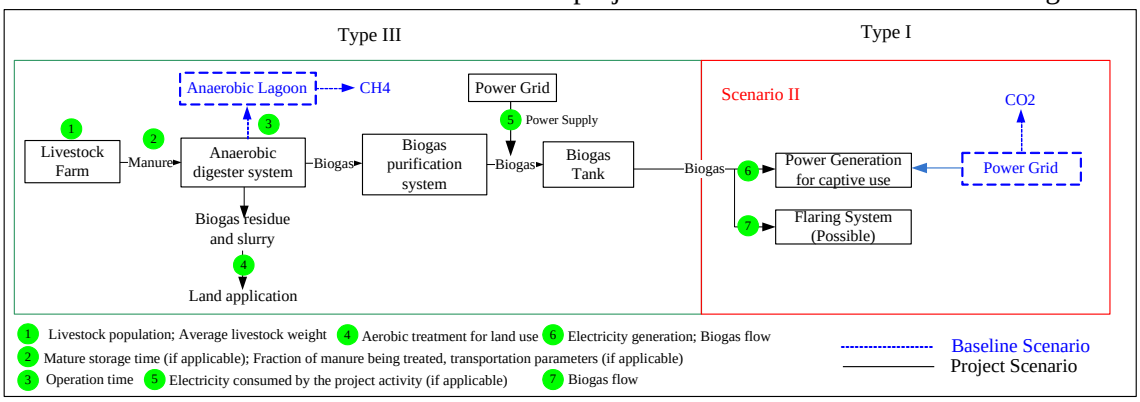

Figure 8.Project boundary

B.4. Description of baseline scenario

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1.Methodology of type III --- manure treatment and avoid methane emission part

As per AMS-III.D., 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.

2.Methodology of type I --- renewable energy part

As per AMS-I.F, the baseline of electricity generation is that the equivalent electricity would be

generated by Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province).

Therefore, it can be concluded from above that, the baseline scenario for a CPA is that, animal manure is treated anaerobically without methane recovery and destruction, and the equivalent electricity is generated based on ECPG or SCPG.

B.5. Demonstration of eligibility for a generic CPA

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The CPA is eligible for inclusion in the PoA because it meets all of the criteria outlined in section B.2 of Part I of PoA-DD:

No.	Eligibility criteria	Situation of CPA	Evidence Sample
1.	All the project activities under the CPA should be located in the boundary of the PoA, i.e. within Anhui Province or Jiangsu Province or Yunnan Province.	The livestock farms included in the CPA are located in XXX, XXX respectively, which are within Anhui Province or Jiangsu Province or Yunnan Province.	--FSR --Business license
2.	Each project activity owner under the CPA should sign a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	The potential individual project owner included in the proposed CPA has/will signed a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
3.	Every CPA in aggregate meets the small-scale criteria and remains within those thresholds throughout the crediting period of the CPA, i.e., The emission reductions from type III components of the CPA should be equal to or less than 60,000 tCO_2/y and the total installed/rated/added energy generation capacity of the CPA should be equal to or less than 15 MW_{ele}.	In the CPA, the emission reductions from type III components is XXX tCO_2/y, which is no more than 60,000 tCO_2/y, and the total installed/rated energy generation capacity of the project equipment is XX MW_{ele}, less than 15 $MW_{ele.}$	--FSR or FSR approval; --Equipment brand/ nameplate; or --Equipment purchase contract; --CPA lists --ER Calculation worksheet;
4.	The proposed small-scale CPA is not a debundled component of a large scale activity, 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, if the CPA will satisfy any of the conditions below: (a)Doesn't have the same activity owner as the proposed small scale CPA or doesn't have a coordinating or managing entity, which also manages a large scale	The proposed small-scale CPA cannot satisfy the following criteria at the same time： (a)Has the same activity owner as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology and. measure; (b)The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the cloest point. Therefore, the CPA is not a de-bundled component of a	--FSR; --Documents from local government; --Onsite Survey.

	PoA of the same technology/measure Or (b)There is no any activity[9] with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.	large activity;	
5.	The start date of the project activities under the CPA, which is the earliest date among equipment purchase date, debt contract date and construction start date, are later than the PoA GSC start date (14/06/2012).	The starting date of the CPA is decided by the starting date of each project activity included. The project activities' starting date are expected to be DD/MM/YYYY, which are after the GSP date, so it can be met.	--Equipment purchasing contract --Construction contract or construction start record
6.	The PoA start date is 01/02/2013, or the submission date of the PoA, whichever is earlier, so the CPA crediting period does not exceed 31/01/2040(the PoA end date).	The end date of CPA crediting period is DD/MM/YYYY, which does not exceed the PoA end date.	--CPA-DD
7.	A CPA should meet any one of following criteria for assessing additionality: (a)Meets relevant requirements in paragraph 2(a) and (4a) of the *Guidelines for demonstrating additionality of microscale project activities*, including: ✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;country ✓ The total installed capacity of the CPA is no more than $15MW_{ther}$; ✓The emission reductions from type III components of the CPA are no more than 20 $ktCO_2e$ per year; (b) Meets relevant requirement for the positive list of technologies and project activity types that are defined	The CPA meet the criterion (a/b) as described in the section B.5 below.	--ER Calculation worksheet --Income statement --IRR Calculation worksheet

[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

	as automatically additional in paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including: ✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs); ✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year; ✓ The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$ (c) The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.		
8.	The project activities under the CPAs are not sponsored by any funding from Annex I parties.	No public funding from Annex I parties have been provided	--Project approval or --Confirmation by the project owner
9.	Each project activities included in the CPA must have obtained approval of EIA.	Each project activity included in the CPA have obtained approval of EIA.	--EIA and its approval
10.	Measures should be taken to avoid double counting of emission reductions for the CPA, like unique identifications of product and end-user locations (e.g. programme logo).	Each CPA and project activitie have a unique identification as CPAXXXX and LFXXXX, and also, programme logo will be used to uniquely identify the product and end-user locations;	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being

				subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
11.	All the project activities under the CPA are to install new anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered biogas.		All activities under the CPA are to install new anaerobic reactors in livestock farms to achieve methane recovery and utilization.	-- FSR or FSR approval; --Technical flow figure
12.	The CPA complies with applicability and other requirements of applied methodologies. 1) All relevant applicability criteria of methodology AMS-III.D shall be met; detailed analysis is conducted in section B.2 of Part II of PoA-DD. 2) There are four scenarios for energy generation involved in the PoA as follows:		The applicability criteria of methodology AMS-III.D are met.	--On-site photo or --FSR or FSR approval --EIA or EIA approval --History Record of livestock farms --Statement by Related Agriculture Bureau --Technical demonstration --Official data at the nearest meteorological station, or -- Data available from historical on site observations
12.1	***Scenario I*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households...	The CPA under scenario I will satisfy the applicability of Methodology AMS-I.C; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	
12.2	***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 satisfy the applicability of Methodology AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	The CPA is following ***Scenario II and*** The applicability criteria of methodology AMS-I.F are met.	

12.3	***Scenario III*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households and for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario III will satisfy the applicability of Methodology AMS-I.C and AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	
12.4	***Scenario IV*** The biogas produced by the project is used for generating electricity delivered to the national or a regional grid.	The CPA under scenario IV will satisfy the applicability of Methodology AMS-I.D; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	

Additionality

<u>Considering CDM before the construction of the CPA</u>

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 (GSC date).

To demonstrate the additionality of each CPA, timeline of the main events involved in the implementation of each CPA will be stated to prove that the project owner took CDM into serious consideration before commencing the CPA. And the project owners have taken successive actions to secure the CDM application before the construction works for the CPA.

<u>Additionality demonstration of the CPA</u>

According to eligibility criteria (7) for inclusion of a SSC-CPA in the PoA described in the Section B.2, the activity included in the proposed CPA could be proved additional via any of the following three approaches, and the CPA could be proved additional only if all the activities included are additional.

1. **Meets relevant requirement in** in paragraph 2(a) and paragraph 4(a) of the **"*Guidelines for demonstrating additionality of microscale project activities*", including:**
   a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country;
   b) The total installed capacity of the CPA is no more than $15MW_{th}$ (for electricity generation, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM methodologies", then the total thermal installed capacity should meet this criteria);
   c) The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year.
2. **Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in** paragraph 2(c) of the **"*Guidelines on the demonstration of additionality of small-scale project activities*", including:**
   a) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);
   b) The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year;
   c) The installed capacity of each unit in the activities included in the CPA is less than 2,250 $KW_{th.}$
3. **The third method (Meets relevant requirement in "*General Guidelines to SSC CDM methodologies*", which also refer to "*Tool for the Demonstration and Assessment of Additionality" and "Guidelines on the Assessment of Investment Analysis",* including):**
   The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.

The additionality demonstration of each approach is as follows:

Approach (1)

According to paragraph 2(a) and paragraph 4(a) of the "*Guidelines for demonstrating additionality of microscale project activities*", Project activities up to five megawatts (or 15 MW_{th}) that employ renewable energy technology for Type 1, and up to 20,000 tCO_2e of annual emission reduction for Type III projects could be determined as additional directly.

Thus, the following table are applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the CPA under the PoA	Real situation of the CPA	Applicable? (Y/N)
1	The total installed capacity of the project is no more than $5MW_e$ ($15MW_{thermal}$). ($5MW_e \times 3$, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM Methodologies")	The total installed capacity of the CPA is no more than $5MW_e$ ($15MW_{thermal}$).		
2	The emission reductions from type III components of the project is no more than 20 $ktCO_2e$ per year .	The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year		
3	The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country.	The geographic location of the projects in the CPA is in a special underdeveloped zone of the P.R. China identified by the Government via any one of the following methods: a)The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50% calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; b)The GNI per capita in		

		the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures which is calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; c)Based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by EB of the CDM and published on the UNFCCC website.		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (2)

According to paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds.

According to CPA Eligibility criteria (3), the installed capacity and project size of all the activities included in the CPA are below the limitation of small-scale CDM projects. Thus, the following table is applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the activity in the CPA under the PoA	Real situation of the activity in the CPA	Applicable? (Y/N)
1	Project activities solely composed of isolated units	All the equipment units in the activity is solely		

	where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs)	isolated where the users are households or communities or Small and Medium Enterprises (SMEs)		
2	the size of each unit is no larger than 5% of the small-scale CDM	-The installed capacity of each unit for the Type I measure that employ renewable energy technology is no larger than 2.25MW (thermal); -The annual emission reduction of each unit for the Type III measure is no larger than 3,000 tCO_2e (thermal).		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (3)

According to the "*Guidelines on the demonstration of additionality of small-scale project activities*", following methods could be used for the demonstration of additionality:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The CPA is additional only if all the projects under the CPA are proved to be additional according to the paragraph 1(a) of "*Guidelines on the demonstration of additionality of small-scale project activities*":

Investment Barrier

Investment barrier analysis will be applied for all the projects under the CPA. The following steps in the "*Tool for the Demonstration and Assessment of Additionality*" will be applied:

Step 1 Determine appropriate analysis method

Step 2 Determine the benchmark

Step 3 Calculation and comparison of financial indicators

Step 4 Sensitivity analysis

Substep 1 Determine appropriate analysis method

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

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

Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. However, the project scenario of each CPA has more output service than the baseline scenario, thus they are not comparable. Therefore, the investment comparison analysis is not preferable.

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

Substep 2 Determine the benchmark

The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming. Only the CPA financial indicator is better than or equivalent to the benchmark, the project is economic attractive or financially feasible.

Substep 3 Calculation and comparison of financial indicators

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

Table 5.Financial Parameters of the CPA

No.	Parameter	Value	Units	Source
1	Static total investment		10,000RMB	
2	Total biogas generation		10,000m^3/year	
3	Annual total revenue		10,000RMB	
4	Project lifetime (include construction period)		years	
5	Annual O&M cost		10,000RMB	
6	Rate of VAT		%	
7	Rate of income tax		%	
8	Rate of city maintenance and construction tax		%	
9	Rate of education fee addition		%	
10	Annual CERs (emission reduction)		tCO_2e	
11	CERs price		EUR/tCO_2e	
12	Benchmark		%	

Generally values that were applied at the moment of the investment decision shall be used for the analysis above. Mostly, the Feasibility Study Report will be widely used in China.

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

Farm No.	IRR without CDM revenue	IRR with CDM revenue
LF0001		
……		
LFXXXX		

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 additional revenue is lower than the benchmark.

According to "Guidelines 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:

1)Static total investment
2)Annual revenue
- Annual biogas output
- Biogas sale price (incl. VAT)
- Annual power output
- Electricity purchase price (incl. VAT)
- Coal saving
- Coal price (incl. VAT)

3)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 four indicators varied in the range of -10%-+10%.

Table 6.Sensitivity analysis

	-10%	-5%	0%	5%	10%
Static total investment					
Annual revenue					
1)Annual biogas output					
2)Biogas sale price (incl. VAT)					
3)Annual power output					
4)Electricity purchase price (incl. VAT)					
5)Coal saving					
6)Coal price (incl. VAT)					
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.

Critical Analysis

LF0001	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	
LFXXXX	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	

Therefore, each activity in the CPA and the whole CPA is additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

I. Calculate baseline emissions

Baseline emissions of the project include baseline emissions from methane and CO_2 emissions from energy generation in the absence of the CPA. Thus, the baseline emission is calculated as follows:

$$BE_y = BE_{CH4,y} + BE_{Ele,y} \quad (2\text{-}1)$$

Where:

BE_y Baseline emissions in year y (tCO_2e)

$BE_{CH4,y}$ Baseline emissions due to methane recovery in year y (tCO_2e)

$BE_{Ele,y}$ Baseline emissions from electricity generation in year y (tCO_2e)

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

According to AMS-III.D, paragraph 9, $BE_{CH4,y}$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 9(a) is adopted in a CPA, which is as below:

$$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \quad (2\text{-}2)$$

Where:

$BE_{CH4,y}$ Baseline emissions due to biogas recovery in year *y* (tCO_2e)

GWP_{CH4} Global Warming Potential (GWP) of CH_4 (21)

D_{CH4} CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) 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)

Fraction of manure handled in baseline animal manure management system *j*

UF_b Model correction factor to account for model uncertainties (0.94)[10]

Determination of $B_{0,LT}$

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

According to AMS-III.D, 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 source. Since 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.

In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. The preferred method to obtain *VS* is to use data from nationally published sources. These values shall be compared with IPCC default values and any significant differences shall be explained. If data from nationally published sources are not available, country-specific *VS* excretion rates can be estimated from feed intake levels, via the enhanced characterisation method (tier 2) described in section 10.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. If 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;

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:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \qquad (2\text{-}3)$$

Where:

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 the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. Alternatively, the IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used.

Since the country-specific *MCF* is unavailable, the IPCC default values will therefore be adopted in the 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 observation.

Determination of $N_{LT,y}$

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

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right) \quad (2\text{-}4)$$

Where:

$N_{da,y}$ 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 $BE_{Ele,y}$

According to AMS-I.D and AMS-I.F, $BE_{Ele,y}$ should be calculated as below:

$$BE_{Ele,y} = EG_{Ele,y} \times EF_{grid,CM,y} \quad (2\text{-}5)$$

Where:

$EG_{Ele,y}$ *Quantity of net electricity generated by the project activity in year y (MWh/yr)*

$EF_{grid,CM,y}$ *Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system";*

II. Calculate project emissions

According to AMS-III.D, 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 ($PE_{storage,y}$)

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (2\text{-}6)$$

Where:

PE_y	Project emissions 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.AO (tCO_2e)
$PE_{storage,y}$	Emissions from the storage of manure (tCO_2e)

Determination of $PE_{PL,y}$

According to AMS-III.D, $PE_{PL,y}$ is calculated as follows:

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (2\text{-}7)$$

Where:

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

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 formulae below:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (2\text{-}8)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the biogas in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h (kg/h)
$\eta_{flare,h}$	Flare efficiency in hour h; 0 is used for this parameter. This is conservative.
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (2\text{-}9)$$

Where:

$TM_{RG,h}$ Mass flow rate of methane in the biogas in the hour h; (kg/h)

$FV_{RG,h}$ Volumetric flow rate of the biogas in dry basis at normal conditions in hour h;(m^3/h)

$fv_{CH4,RG,h}$ Volumetric fraction of methane in the biogas on dry basis in hour h; The default value of 60% will be used.

$\rho_{CH4,n}$ Density of methane at normal conditions (0.716); (kg/m^3)

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

As fossil fuel is not involved in the CPA, $PE_{power,y}$ is equivalent to project emissions from electricity consumption. According to AMS-III.D, project emissions from electricity consumption are determined as per the procedures described in AMS-I.D, which is calculated as below:

$$PE_{power,y} = EC_{ele,PJ,y} \times EF_{grid,CM,y} \quad (2\text{-}10)$$

Where:

$EC_{ele,PJ,y}$ Quantity of net electricity consumed by the Project in year *y* (MWh/yr)

$EF_{grid,CM,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*";

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

According to the*"Tool to calculate the emission factor for an electricity system",* The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin"(OM) and "build margin"(BM) as well as the "combined margin"(CM).

The tool provides procedures to determine the following parameters:

Parameter	Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

The following is the detailed process of calculating the baseline CO_2 emission factor of the grid which the Project connected to according to the steps provided by the *Tool to calculate the emission factor for an electricity system (*hereafter referred to as the *Tool).*

Sub-step 1. Identify the relevant electricity system.

Chinese DNA has published a delineation of the project electricity system and connected electricity system. The project physically connects through transmission and distribution lines to the East China

Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province, the project boundary also includes power plants connected to ECPG or SCPG.

Project Location	Power gird	Local power grids
Anhui and Jiangsu Province	East China Power Grid (ECPG)	Shanghai City, Jiangsu, Zhejiang, Anhui, Fujian Province
Yunnan Province	Southern China Power Grid (SCPG)	Guangdong, Guangxi, Yunnan, Guizhou, Hainan Province

Sub-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.

Since the data of the off-grid power plants is not available, Option I is applied to calculate the operating margin and build margin emission factor.

Sub-step 3. Select a method to determine operating margin (OM).

According to the *Tool*, four methods compute the Operating Margin Emission factor can be used as follows:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. If the dispatch data is available the (c) Dispatch Data Analysis OM method should be the first methodological choice, while in case of the Project, the (a) Simple OM method is adapted with two reasons as follows:

(1)In cases where China presently the power grid dispatch and load data are unavailable as business secrets, so (b) and (c) cannot apply in the Project for calculating the Operating Margin Emission Factor ($EF_{grid,OM,y}$).

(2)In the five most recent years from 2006 to 2010, the low-cost/must run resources[11] constituted less than 50%[12] of total power generation of the grid. As a result, the simple OM method can be used to

[11] 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.

[12] For ECPG, the ratios are 38.18%, 35.26%, 35.47%, 39.42% and 38.40% from 2006 to 2010 respectively. For SCPG, the ratios are 28.61%, 27.14%, 27.89%, 34.50% and 30.91% from 2006 to 2010 respectively.

calculate the operating margin emission factor 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.

Sub-step 4. Calculate the operating margin emission factor according to the selected method.

From the *Tool to calculate the emission factor for an electricity system*, ($EF_{grid,simple,OM}$) may be calculated:

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

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.

Because the fuel consumption data is unavailable for each power plant / unit, Operation A cannot be used. At the same time 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 so Option B was the only operation can be used.

Where Option C is used, the simple OM method formula of $EF_{Grid,OM,Simple,y}$ calculation is:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \quad (2\text{-}11)$$

where:

$EF_{grid,OMsimply,y,}$ simple operating margin CO_2 emission factor in year y(tCO_2/MWh);

$FC_{i,y}$ amount of fossil fuel type i consumed in the project electricity system in year y ;

$NCV_{i,y}$ 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 (tCO_2/GJ) and

EG_y net electricity generated and delivered to the grid by power plant / unit m in year y (MWh);

i all fossil fuel types combusted in power sources in the project electricity system in year y;

y either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

When there exists net electricity imports from a connected electricity system within the same host country(ies):

(1) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(2) the emission factor of the exporting grid, if the specific plants are not clearly known.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2008 to 2010 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2, Chap 1, Page 1.21-1.24.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,OM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.8367** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.9489** tCO_2/MWh

Sub-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.

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 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.

The PDD choose Option 1.

According to the *Tool*, the following equation (11) is adopted to calculate .

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (2\text{-}12)$$

where:

$EF_{grid,BM,y}$ build margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{m,y}$ net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m power units included in the build margin;

y most recent historical year for which power generation data is available;

Consider of data availability, The Project adopted the following deviation method which was published by Chinese DNA and accepted by CDM EB[13]:

1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.

2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

(1) Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year

$$\lambda_{Coal,\,y} = \frac{\sum_{i \in COAL,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}} \quad (2\text{-}13)$$

$$\lambda_{Oil,\,y} = \frac{\sum_{i \in OIL,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}} \quad (2\text{-}14)$$

$$\lambda_{Gas,\,y} = \frac{\sum_{i \in GAS,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}} \quad (2\text{-}15)$$

where:

$F_{i,j,y}$ the amount of fuel i (in a mass or volume unit) consumed by power j in year(s) y;

NCV_{ij} Net calorific value (energy content) per mass or volume unit of a fuel *i* in yea*r y*;

$EF_{i,j,y}$ the CO_2 emission coefficient of fuel i (tCO2/GJ);

(2) Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China

$$EF_{Thermal,\,y} = \lambda_{Coal,\,y} \times EF_{Coal,\,Adv,\,y} + \lambda_{Oil,\,y} \times EF_{Oil,\,Adv,\,y} + \lambda_{Gas} \times EF_{Gas,\,Adv,\,y} \quad (2\text{-}16)$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas.Adv,y}$ represents the efficiency level of the best coal-fired, oil-based

[13] http://cdm.unfccc.int/Projects/Deviations ; DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China"

and gas-based power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (2\text{-}17)$$

Where $CAP_{Total,y}$ $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid,* the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2009 (311.5 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (237.4 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,BM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.6622** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.3157** tCO_2/MWh

Sub-step 6. Calculate the combined margin emissions factor.

Based on the *Tool to calculate the emission factor for an electricity system*, the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y} \quad (2\text{-}18)$$

According to the *Tool to calculate the emission factor for an electricity system*, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.74945** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.6323** tCO_2/MWh

Determination of $PE_{transp,y}$

According to AMS-III.AO, the emissions from incremental transportation are calculated as below:

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (2\text{-}19)$$

Where:

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)

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:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k\ (AI_l-d)}) * MCF_l * B_{0_{LT}})\right] \quad (2\text{-}20)$$

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
MCF_l	Annual methane conversion factor for the project manure storage device l from Table 10.17, Chapter 10, Volume 4

III. Calculate Leakage emissions

No energy generating equipment is transferred from outside the boundary to the PoA. In addition, the

collection/processing/transportation of animal manure is inside the project boundary. As per AMS-III.D., AMS-I.F., leakage can be neglected.

IV. Calculate Emission Reductions

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

$$ER_y = BE_y - PE_y \quad (2\text{-}21)$$

Where:

ER_y	Emission reductions in year y (tCO_2e)

According to AMS-III.D, 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 from methane recovery in any year are the lowest value of the following:

$$ER_{CH4,y,ex\,post} = \min[(BE_{CH4,y,ex\,post} - PE_{CH4,y,ex\,post}),(MD_y - PE_{power,y,ex\,post})] \quad (2\text{-}22)$$

Where:

$ER_{CH4,y,ex\,post}$	Emission reductions achieved from methane recovery based on monitored values for year y (tCO_2e)
$BE_{CH4,y,ex\,post}$	Baseline emissions calculated using equation 1 of AMS-III.D (for projects using option in paragraph 9 (a)) using *ex post* monitored values of $N_{LT,y}$
$PE_{CH4,y,ex\,post}$	Project emissions calculated using equation 5 of AMS-III.D using *ex-post* monitored values of $N_{LT,y}$,$MS\%_{i,y}$, $MS\%_{l}$, AI_l , $Q_{res\ waste,y}$ 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 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:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \quad (2\text{-}23)$$

Where:

$BG_{burnt,y}$	The amount of biogas utilized in year y (m^3)
$w_{CH4,y}$	Methane content in biogas in the year y (volume fraction)
FE	Flare efficiency of biogas utilized for energy generation in year (fraction, 100% is applied, determined by paragraph 22 of AMS-III.D)

In conclusion, emission reductions from energy generation are summarized as below:

$$ER_{y,ex\ post} = ER_{CH4,\ y,ex\ post} + BE_{Ele,\ y} \quad (2\text{-}24)$$

Where:

$ER_{y,ex\ post}$	Emission Reductions based on monitored values for year *y* (tCO_2e)
$ER_{CH4,\ y,ex\ post}$	Emission reductions achieved from methane recovery based on monitored values for year *y* (tCO_2e)
$BE_{Ele,\ y}$	Baseline emissions from electricity generation in year y (tCO_2e)

B.6.2. Data and parameters that are to be reported ex-ante

Data and parameters that are to be reported ex-ante

Data / Parameter	MCF_j
Unit	%
Description	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data	IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	For the MCF value, country-specific MCF values are not available, so he IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 was used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$B_{O,LT}$
Unit	$m^3/CH_4/kg$ dm
Description	Maximum methane producing potential of the volatile solid generated for animal type "LT"
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	According to AMS-III.D, The maximum methane-producing capacity of the manure (Bo) varies by species and diet. Since country specific Bo 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. In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$MS\%_{Bl,j}$
Unit	%
Description	Fraction of manure handled in baseline animal manure management system "j"
Source of data	FSR
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	All manure handled in baseline animal manure management.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$W_{default}$
Unit	kg
Description	Default average animal weight of a defined population
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$VS_{default}$
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	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	IPCC default value is credible data source. In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	MCF_l
Unit	-
Description	Annual methane conversion factor for the project manure storage device *l*
Source of data	Table 10.17, Chapter 10, Volume 4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See individual CPA-DD
Choice of data or Measurement methods and procedures	According to the Methodology AMS III.D., IPCC default value should be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$fv_{CH4,RG,h}$
Unit	-
Description	Volumetric fraction of methane in the residual gas on dry basis in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	60%
Choice of data or Measurement methods and procedures	A default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$w_{CH4,y}$
Unit	-
Description	Methane content in biogas in the year *y*
Source of data	AMS-III.D.
Value(s) applied	60%
Choice of data or Measurement methods and procedures	According to AMS-III.D., a default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	η_{flare}
Unit	-
Description	Flare efficiency in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0
Choice of data or Measurement methods and procedures	0 is used for this parameter. This is conservative.
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the flaring is involved

Data / Parameter	EF_{CO2}
Unit	tCO_2/km
Description	CO_2 emission factor from fuel use due to transportation
Source of data	Since there is no such parameter in IPCC 2006 Guidelines, thus the value in IPCC 1996 is applied
Value(s) applied	0.001011
Choice of data or Measurement methods and procedures	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the material transportation is involved

Data / Parameter	$\rho_{CH4,n}$
Unit	kg/m^3
Description	Density of methane at normal conditions
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	Tool to determine project emissions from flaring gases containing methane
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	EG_y
Unit	MWh

Description	Net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data	*China Electric Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$FC_{i,y}$
Unit	mass or volume unit
Description	Amount of fossil fuel type i consumed in the project electricity system in year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$F_{i,j,y}$
Unit	Mass or volume
Description	The fuel consumption of fuel i in power plant j during year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$NCV_{i,y}$
Unit	TJ/t, TJ/km^3
Description	Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*

Source of data	*China Energy Statistical Yearbook, 2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ (tCO_2e/TJ)
Description	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$OXID_{i,y}$
Unit	%
Description	Oxidation factor of the fuel *i* in year *y*
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	**Internal use rate of power plant**
Unit	%
Description	The internal power consumption of power plants in year(s) *y*
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.

Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$CAP_{i, j, y}$
Unit	MW
Description	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Coal, Adv}$
Unit	%
Description	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	39.65%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Oil, Adv}$
Unit	%
Description	The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%

Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Gas, Adv}$
Unit	%
Description	The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the .Tool to calculate the emission factor for an electricity system.
Source of data	As per the "Tool to calculate the emission factor for an electricity system."
Value(s) applied	Official data

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	0.74945 tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	0.6323 tCO_2/MWh

Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system."
Purpose of data	Calculation of baseline and project emissions
Additional comment	Office data

B.6.3. Ex-ante calculations of emission reductions

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The ex-ante emission reduction calculations will be done in each specific CPA-DD on the basis of the equations in section B.6.1. above and the option chosen as per the EF tool during the process of inclusion of a CPA in the PoA.

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	W_{site}
Unit	kg
Description	Average animal weight of a defined livestock population at the CPA site
Source of data	Farm Owners
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Farm owners will measure weight of livestock alive with mass scale and calculate the average in a project year.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	nd_y
Unit	day
Description	Number of days in year "y" where the animal manure management system is operational.
Source of data	Assumed 365 days in the CPA, actual data is from the measurement.
Value(s) applied	365
Measurement methods and procedures	The data is obtained from the operation records of the the animal manure management system,system as the sum of operation hours.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{da,y}$
Unit	Number
Description	Number of days animal is alive in the farm in the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{p,y}$
Unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{i,y}$
Unit	%
Description	Fraction of manure handled in system *i* in year *y*
Source of data	The farm owners, all manure handled in CPA animal manure management.
Value(s) applied	The data used in the CPA is come from the farm owners, the actual data should be monitored annually based on monthly records.
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{l}$
Unit	-
Description	Fraction of volatile solids (%) handled by storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	AI_l
Unit	days
Description	Annual average interval between manure collection and delivery for treatment at a given storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-treated in the year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$Q_{y,treatment}$
Unit	tonnes
Description	Quantity of compost produced in year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$CT_{y,treatment}$
Unit	tonnes/truck
Description	Average truck capacity for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$DAF_{treatment}$
Unit	km/truck
Description	Average distance for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$B_{biomass-3,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas supplied to power generator in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meter installed at the inlet of the generator.
Monitoring frequency	
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas combusted in year "y"
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by flow meter
Monitoring frequency	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$FV_{RG,h}$
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
Source of data	Onsite measurement by flow meter
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Biogas sent to the flare will be monitored through the use of biogas flow meter continuously and reported cumulatively on weekly basis.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter will only be monitored when there is surplus gas from the Project and a flare is installed. The flow meter will undergo maintenance/calibration annually subject to appropriate industry standards by qualified entity.

Data / Parameter	P_{PJ}
Unit	Pa
Description	Pressure of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The pressure of the biogas will be recorded daily using manometer and monthly averaged.
Monitoring frequency	–

QA/QC procedures	The manometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	T_{PJ}
Unit	°C
Description	Temperature of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The temperature of the biogas will be recorded daily using thermometer and monthly averaged.
Monitoring frequency	-
QA/QC procedures	Thermometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{Ele,y}$
Unit	MWh/year
Description	Quantity of net electricity generated by the project activity in year y
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Monitoring frequency	Electricity meters should be installed to measure the quantity of the electricity generated by each SSC-CPA in year y.
QA/QC procedures	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EC_{ele,PJ,y}$
Unit	MWh/year
Description	Quantity of net electricity consumed by the CPA in year *y*
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers. At the same time the invoice should be used for verification.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Soil application of the residue waste
Unit	-
Description	Soil application (not resulting in methane emissions) of the residual waste.
Source of data	The actual information should be assessed through onsite check
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The soil application when the final sludge used will be monitored and recorded by the project owner.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

B.7.2. Description of the monitoring plan for a generic 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 project owner is responsible for the implementation of the monitoring plan, and the consumers cooperate with the project owner.

1.Monitoring Parameters

Data/parameters needed to be monitored are listed below in the table:

No.	Data/Parameter	Description	Source of data	Record Frequency
1	W_{site}	Average animal weight of a defined livestock population at the CPA site	Farm Owners	-
2	nd_y	Number of days in year "y" where the animal manure management system is operational.	Farm Owners	-
3	$N_{da,y}$	Number of days animal is alive in the farm in the year y	Farm Owners	monthly
4	$N_{p,y}$	Number of animals produced annually of type LT for the year y	Farm Owners	monthly
5	$MS\%_{i,y}$	Fraction of manure handled in system *i* in year *y*	Farm Owners	monthly
6	$MS\%_{l}$	Fraction of volatile solids (%) handled by storage device *l*	Farm Owners	monthly
7	AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device *l*	Farm Owners	monthly
8	Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year	Farm Owners	daily
9	$Q_{y,treatment}$	Quantity of compost produced in year	Farm Owners	daily
10	CT_y	Average truck capacity for transportation	Farm Owners	monthly
11	$CT_{y,treatment}$	Average truck capacity for compost transportation	Farm Owners	monthly
12	DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation	Farm Owners	monthly
13	$DAF_{treatment}$	Average distance for compost transportation	Farm Owners	monthly
14	$B_{biomass-3,PJ,y}$	The net quantity of the biogas supplied to power generator in year *y*	Flow meter	Continuously
15	$BG_{burnt,y}$	Biogas combusted in year "y"	Flow meter	Continuously
16	$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	Flow meter	Continuously
17	P_{PJ}	Pressure of the biogas at the flow measurement site	manometer	daily
18	T_{PJ}	Temperature of the biogas at the flow measurement site	Thermometer	daily
19	$EG_{Ele,y}$	Quantity of net electricity generated by the CPA in year *y*	Electricity meter.	Continuously
20	$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the CPA in year *y*	Electricity meter.	Continuously
21	Soil application of the residue waste	Soil application (not resulting in methane emissions) of the residual waste.	Farm Owners	-

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

The coordinating/managing entity opts for a verification method that does not use sampling. Each CPA will be monitored and verified.

2.Monitoring organization

In order to implement the monitoring plan effectively, the specific person in charge of the CPA is designated by CME to make sure the implementation of monitoring plan and keep in touch with EB, DNA and other relevant parties. The monitoring structure is clearly shown in the following figure.

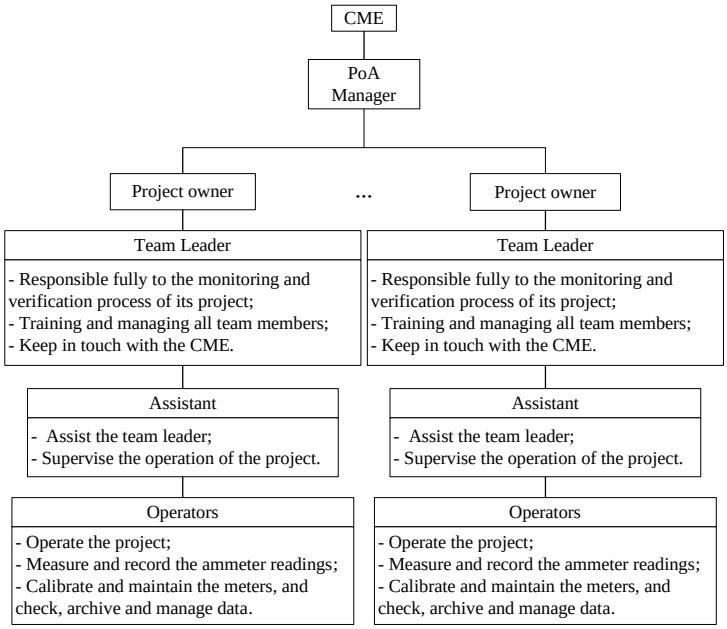

Figure 9.Monitoring team organization

Position	Responsibility description
PoA manager	PoA manager is designated by CME and is in full charge of monitoring and issues related to PoA, in particular: (1) Track the development of POA; keep communication with EB, DNA and related agencies; (2) Establish the monitoring plan and training plan. (3) Collect the data, and supervise implementation of the PoA.
Project Owner	Take in charge of operation and management of project activity, as well as assist PoA manager to conduct monitoring plan according to Management and Monitoring Manual.
Monitoring team	Designated by the project owner, and take in charge of monitoring implementation and the data collection according to the Management and Monitoring Manual.

All data will be bottom-up collected and reported as shown in monitoring structure and finally reported to CME.

This monitoring plan will be carried out by each monitoring team of each livestock farm under the supervision of the CME, designated by the livestock farm owner, 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 such as receipts of biogas sales.

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.

3.Installation of monitoring equipments

Flow metering systems will be installed in the location 6 and 7 respectively to monitor the biogas supplied to power generation system, and if available, the flaring system; and electricity metering system will be installed in location 6 to monitor the electricity generated for captive use; if available, another electricity metering system will be installed in the location 5 to monitor the electricity from power grid consumed by the project activity (ies).

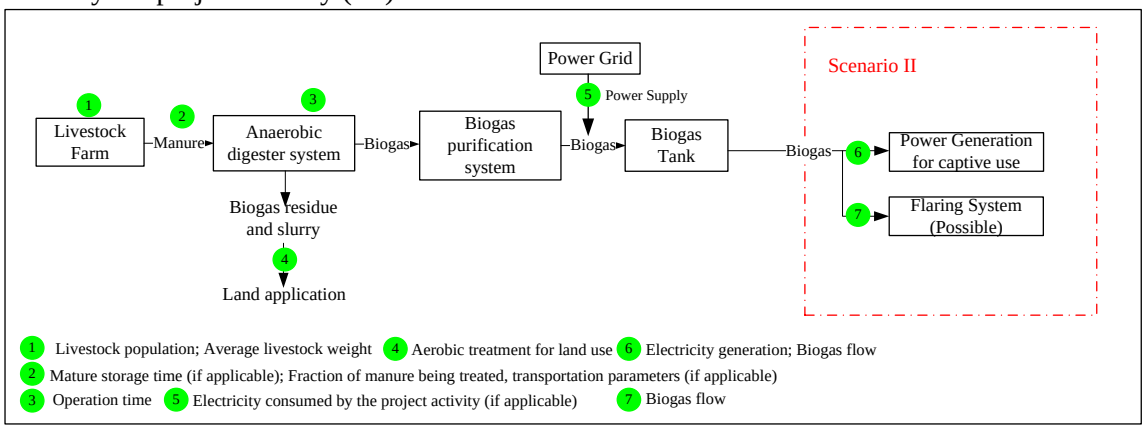

Figure 10.Monitoring system for project scenario

4.Data Collection and Management

All data continuously measured are transmitted to the CME (Each activity owner will take responsibility for data collection). The regular summary should be made and reported to technology department by statistician periodically; all the data after internal validation should be saved up to 2 years after the end of the crediting period.

5.QA/QC

Equipments 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. Once measuring equipment is in fault, it shall be replaced immediately with another calibrated measuring equipment by a professional engineer. During the period of erroneous measurement and replacement of the fault meter, a conservative method that can cause a lower CER value will be used.

If the error of data is caused by accidents during the crediting period, the project owner(s) 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.

6.Training

Before the formal operation of each activity, the person in charge of the CPA will organize the relevant personals to participate the CDM training.

7.Verification

The verification of emission reduction is carried out based on CME's requirements. The CME should provide DOE documents and evidence related to monitoring.

This Part III is for the project activities that follow the Scenario III.

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The purpose of the CPA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for **generate electricity and thermal energy**, and electricity generated will be used for captive use and thermal energy will be supplied to the livestock farm and/or nearby residents.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The following methodologies are applied in the PoA:

AMS-III.D.:	***"Methane recovery in animal manure management systems"* (Ver 18.0);**
AMS-I.F.:	***"Renewable electricity generation for captive use and mini-grid"* (Ver 02.0).**
AMS-I.C.:	***"Thermal energy for the user with or without electricity" (Ver 19.0)***

For more information, please refer to:

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

Those methodologies also refer to:

AMS-III.AO.: Methane recovery through controlled anaerobic digestion (Ver 1.0)
Tool to calculate the emission factor for an electricity system (Ver 02.2.1);
Tool to determine project emissions from flaring gases containing methane (Ver 01);
Tool for the Demonstration and Assessment of Additionality (Ver 06.0.0);
Guidelines on the Assessment of Investment Analysis (Ver 05);
Guidelines for demonstrating additionality of microscale project activities (Ver 04.0);
Guidelines on the demonstration of additionality of small-scale project activities (Ver 09.0)
General Guidelines to SSC CDM methodologies (Ver 19.0);
Standard for Application of Multiple CDM Methodologies for a Programme of Activities (Ver 01.0);

For more information, please refer to:

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

According to methodologies above, each of them is approved for use in a PoA.

B.2. Application of methodology(ies)
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1.Methodology of type III --- manure treatment and avoid methane emission part

The project activities under the CPA of the PoA meet the applicability criteria of Methodology **AMS-III.D**. The details analysis on the applicability criteria of Methodology **AMS-III.D** is as the following table:

No.	Applicability Conditions as per AMS-III.D	Situation of a CPA under the PoA
1	The livestock population in the farm is managed under confined conditions;	The livestock in the Project Farm will be all managed under confined conditions, which can be confirmed through onsite check.
2	Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise AMS-III.H "Methane recovery in wastewater treatment" shall be applied;	Waste residue and liquid after treatment will be used as fertilizers, and therefore will not be 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;	According to the document or information of nearby meteorology bureau, the annual average temperature of baseline site will higher than 5°C.
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;	The manure waste is left to decay in the anaerobic lagoon. According to the size of anaerobic lagoons and daily amount of manure, it can be known the retention time of manure waste in the anaerobic treatment system; the depths of lagoon can be known based on the onsite check or the supporting documents provided by the third party, e.g. construction drawing of lagoon.
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	In the baseline scenario, methane from the lagoon will be directly released into atmosphere without any recovery, destruction or utilization activity through the onsite check or the supporting documents provided by the third party.
6	The residual waste from the animal manure management system 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 of the project will be handled aerobically and utilized as fertilizer, which will not result in methane emissions.
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	Biogas tank will be installed in each project activity to achieve that in case of emergency all methane produced from anaerobic digestion can be stored but not emitted to atmosphere, and

		therefore ensure that all methane produced by the digester is destroyed.
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 digester. 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.	Manure collected will be cleaned and transferred into the anaerobic digesters as soon as possible, which usually does not exceed one day.
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".	The project activities under the CPA do not involve landfill methane recovery, wastewater treatment, composting animal manure, or co-digestion of animal manure and other organic matters; therefore this is irrelevant.
10	Different options to utilise 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.	The recovered biogas will be used for generation of thermal, which belongs to option (a).
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".	Each project activity under the CPA is a newly built animal manure treatment system and they can meet the related and relevant requirements in the "*General Guidelines to SSC CDM methodologies*". The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "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".	Each project activity under the CPA is a newly built animal manure treatment system, thus this criterion is not relevant as replacement of equipment is not involved in a CPA under the PoA.
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.	The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "General Guidelines to SSC CDM methodologies".

Based on analysis above, AMS-III.D is applicable to the CPAs under the PoA.

2.Methodology of type I --- renewable energy part

The details analysis on the applicability criteria of Methodology **AMS-I.C.** is same as the following table:

No.	Applicability Conditions as per AMS-I.C	Situation of this Project Activity
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.	The project activities under CPA will use the biogas collected from the anaerobic manure management system to generate thermal energy that displaces the fossil fuel.
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. Cogeneration system may supply one of the following: (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).	N/A Co-generating systems is not involved in a CPA.
3	Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (d)Electricity supply to a grid; (e)Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (f)Combination of (a) and (b).	N/A Co-generating systems is not involved in a CPA.
4	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	The total installed capacity of each CPA under the PoA is less than 45 MW thermal.
5	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.	N/A This criterion is not relevant because each project activity under the CPA is heat generation based on biogas-fired. Co-fired systems are not involved in a CPA.
6	The following capacity limits apply for biomass cogeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical	N/A Co-generating systems is not involved in a CPA.

	energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e., for renewable project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e., no emission reductions accrue from electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e., no emission reductions accrue from thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	
7	The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities 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 comply with capacity limits in paragraphs 4 to 6, and should be physically distinct[14] from the existing units.	N/A The proposal for the CPA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
8	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	N/A The proposal for the CPA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.

[14] Physically distinct units are those that are capable of producing thermal/electrical energy without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

9	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"	According to AMS-I.C as well as "General Guidelines to SSC CDM methodologies" and AMS-III.D, the total installed capacity of the CPA (for electricity capacity, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM methodologies") is no more than $45MW_{th.}$
10	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.	N/A The solid biomass fuel (e.g. briquette) is not involved in the CPA.
11	Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	N/A The solid biomass fuel (e.g. briquette) is not involved in the CPA.
12	In case electricity and/or steam/heat 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 energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displaced.	The supplier will sign contract with consumers to state that, only the supplier can claim emission reductions from the energy displaced.
13	If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	N/A The type III component of a SSC methodology was adopted for the CPA.

According to analysis above, AMS-I.C. is applicable to the CPAs under the PoA.

The details analysis on the applicability criteria of Methodology **AMS-I.F.** is same as the following table:

No.	Applicability Conditions as per AMS-I.F.	Situation of a CPA under the PoA

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.	The project activities under CPA will use the biogas collected from the anaerobic manure management system to generate electricity, and the power will be used for captive use, the electricity generated by each activity will displace electricity from the power grid.
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.	N/A This criterion is not relevant as a mini-grid is not involved in all activities included 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. According to the table 2 in the methodology, project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid), AMS-I.F can be adopted.	Electricity generated by each project activity under the CPA will be consumption for captive purpose, so it is applicable.
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/m2; • 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/m2.	N/A This criterion is not relevant because each project activity under the CPA is power generation based on biogas-fired.

5	For biomass power plants, no other biomass other than renewable biomass are to be used in the project plant.	N/A No biomass other than biogas will be used in the project activities included in a CPA of the PoA.
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).	All the project activities included in a CPA of the PoA are Greenfield plants. It belongs to the option (a).
7	In the case of project activities that involve the capacity 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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
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.	N/A This criterion is not relevant as all the project activities under the CPA are newly built plant.
9	If the unit added has both renewable and non-renewable 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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
10	Combined heat and power (co-generation) systems are not eligible under this category.	Combined heat and power (co-generation) systems is not involved in a CPA.
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.	N/A The generated electricity is used by livestock farm itself and will not be delivered to another facility or facilities within the project boundary.

According to analysis above, AMS-I.F. is applicable to the CPAs under the PoA.

According to Para 29(c) in Annex 3 "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (Version 01.0) of EB 65, combinations of methodologies mentioned above are eligible to be adopted in the PoA.

In conclusion, different combinations of methodologies will be used in the PoA according to the CPA scenario.

B.3. Sources and GHGs

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As per Methodology AMS-III.D, AMS-I.F and AMS-I.C, 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.

Furthermore, as the CPA will need to purchase electricity from Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province), the project boundary also includes power plants connected to ECPG or SCPG. Emissions sources included in or excluded from the project boundary are shown in the following Table.

Table 7.The emission source and the category of GHG

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the waste 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	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity generation	**CO_2**	**Included**	**The major source of emissions**
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	**CO_2**	**Included/Excluded**	**Determined by the project owner under the CPA**
		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	CO_2 emissions from the decomposition of organic waste are not accounted
		N_2O	Excluded	Excluded for simplification.
	Emissions from flaring or combustion of the gas stream	CO_2	Excluded	Excluded for simplification.
		CH_4	**Included**	**The major source of emissions in case flaring is involved.**
		N_2O	Excluded	Excluded for simplification.
	Emissions from the use of fossil fuel or electricity	**CO_2**	**Included**	**The major source of emissions.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from incremental transportation distances	**CO_2**	**Included**	**In case of incremental transportation was occurred compared with project scenario and baseline scenario, This emissions are accounted.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from the storage of manure before being fed into the anaerobic digester	**CH_4**	**Included**	**This source of emissions 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%.**
		CO_2	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.

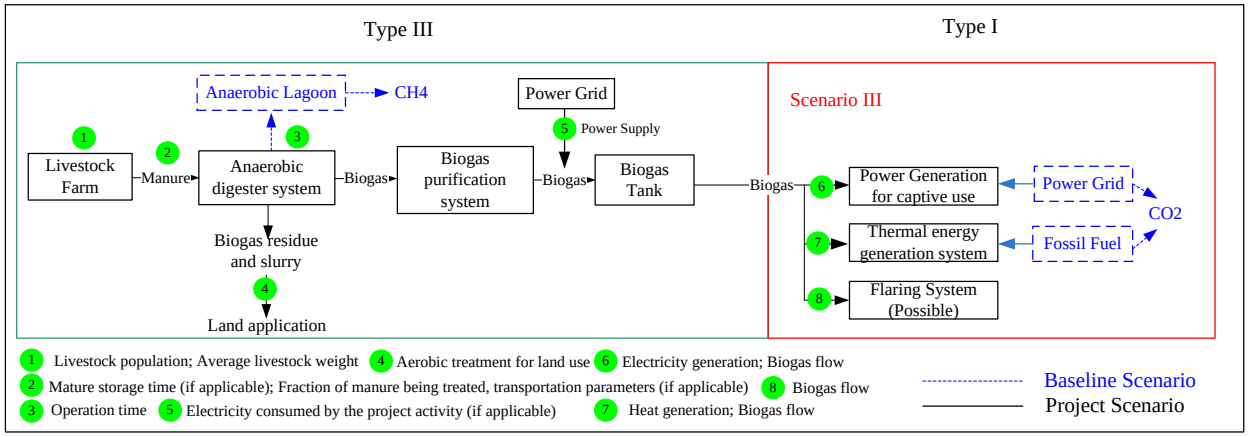

Figure 11.Project boundary

B.4. Description of baseline scenario

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1.Methodology of type III --- manure treatment and avoid methane emission part

As per AMS-III.D., 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.

2.Methodology of type I --- renewable energy part

As per AMS-I.C, 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.

As per AMS-I.F, the baseline of electricity generation is that the equivalent electricity would be generated by Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province).

Therefore, it can be concluded from above that, the baseline scenario for a CPA is that, animal manure is treated anaerobically without methane recovery and destruction, and the equivalent electricity is generated based on ECPG or SCPG and the equivalent thermal energy is generated based on coal.

B.5. Demonstration of eligibility for a generic CPA

>>

The CPA is eligible for inclusion in the PoA because it meets all of the criteria outlined in section B.2 of Part I of PoA-DD:

No.	Eligibility criteria	Situation of CPA	Evidence Sample
1.	All the project activities under the CPA should be located in the boundary of the PoA, i.e. within Anhui Province or Jiangsu Province or Yunnan Province.	The livestock farms included in the CPA are located in XXX, XXX respectively, which are within Anhui Province or Jiangsu Province or Yunnan Province.	--FSR --Business license
2.	Each project activity owner under the CPA should sign a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	The potential individual project owner included in the proposed CPA has/will signed a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
3.	Every CPA in aggregate meets the small-scale criteria and remains within those thresholds throughout the crediting period of the CPA, i.e., The emission reductions from type III components of the CPA should be equal to or less than 60,000 tCO_2/y and the total installed/rated/added energy generation capacity of the CPA should be equal to or less than 15 MW_{ele}/45 MW_{ther}.	In the CPA, the emission reductions from type III components is XXX tCO_2/y, which is no more than 60,000 tCO_2/y, and the total installed/rated energy generation capacity of the project equipment is XX MW_{ele}/MW_{ther}, less than 15 MW_{ele}/45 $MW_{ther.}$	--FSR or FSR approval; --Equipment brand/ nameplate; or --Equipment purchase contract; --CPA lists --ER Calculation worksheet;
4.	The proposed small-scale CPA is not a debundled component of a large scale activity, 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, if the CPA will satisfy any of the conditions below: (a)Doesn't have the same activity owner as the proposed small scale CPA or doesn't have a coordinating or managing entity, which also	The proposed small-scale CPA cannot satisfy the following criteria at the same time： (a)Has the same activity owner as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology and. measure; (b)The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the cloest point. Therefore, the CPA is not a de-bundled component of a	--FSR; --Documents from local government; --Onsite Survey.

	manages a large scale PoA of the same technology/measure Or (b)There is no any activity[15] with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.	large activity;	
5.	The start date of the project activities under the CPA, which is the earliest date among equipment purchase date, debt contract date and construction start date, are later than the PoA GSC start date (14/06/2012).	The starting date of the CPA is decided by the starting date of each project activity included. The project activities' starting date are expected to be DD/MM/YYYY, which are after the GSP date, so it can be met.	--Equipment purchasing contract --Construction contract or construction start record
6.	The PoA start date is 01/02/2013, or the submission date of the PoA, whichever is earlier, so the CPA crediting period does not exceed 31/01/2040 (the PoA end date).	The end date of CPA crediting period is DD/MM/YYYY, which does not exceed the PoA end date.	--CPA-DD
7.	A CPA should meet any one of following criteria for assessing additionality: (a)Meets relevant requirements in paragraph 2(a) and (4a) of the *Guidelines for demonstrating additionality of microscale project activities*, including: ✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;country ✓ The total installed capacity of the CPA is no more than 15MW_{ther}; ✓The emission reductions from type III components of the CPA are no more than 20 ktCO_2e per year;	The CPA meet the criterion (a/b/c) as described in the section B.5 below.	--ER Calculation worksheet --Income statement --IRR Calculation worksheet

[15] 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

	(b) Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including: ✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs); ✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year; ✓The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$ (c) The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.		
8.	The project activities under the CPAs are not sponsored by any funding from Annex I parties.	No public funding from Annex I parties have been provided	--Project approval or --Confirmation by the project owner
9.	Each project activities included in the CPA must have obtained approval of EIA.	Each project activity included in the CPA have obtained approval of EIA.	--EIA and its approval

10.	Measures should be taken to avoid double counting of emission reductions for the CPA, like unique identifications of product and end-user locations (e.g. programme logo).		Each CPA and project activity have a unique identification as CPAXXXX and LFXXXX, and also, programme logo will be used to uniquely identify the product and end-user locations;	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
11.	All the project activities under the CPA are to install new anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered biogas.		All activities under the CPA are to install new anaerobic reactors in livestock farms to achieve methane recovery and utilization.	-- FSR or FSR approval; --Technical flow figure
12.	The CPA complies with applicability and other requirements of applied methodologies. All relevant applicability criteria of methodology AMS-III.D shall be met; detailed analysis is conducted in section B.2 of Part II of PoA-DD. There are four scenarios for energy generation involved in the PoA as follows:		The applicability criteria of methodology AMS-III.D are met.	--On-site photo or --FSR or FSR approval --EIA or EIA approval --History Record of livestock farms --Statement by Related Agriculture Bureau --Technical demonstration --Official data at the nearest meteorological station, or -- Data available from historical on site observations
12.1	***Scenario I*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households...	The CPA under scenario I will satisfy the applicability of Methodology AMS-I.C; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	

12.2	***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 satisfy the applicability of Methodology AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	
12.3	***Scenario III*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households and for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario III will satisfy the applicability of Methodology AMS-I.C and AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	The CPA is following ***Scenario III and*** The applicability criteria of methodology AMS-I.C and AMS-I.F are met.	
12.4	***Scenario IV*** The biogas produced by the project is used for generating electricity delivered to the national or a regional grid.	The CPA under scenario IV will satisfy the applicability of Methodology AMS-I.D; detailed analysis is conducted in section B.2 of Part II of PoA-DD.	N/A	

Additionality

<u>Considering CDM before the construction of the CPA</u>

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 (GSC date).

To demonstrate the additionality of each CPA, timeline of the main events involved in the implementation of each CPA will be stated to prove that the project owner took CDM into serious consideration before commencing the CPA. And the project owners have taken successive actions to secure the CDM application before the construction works for the CPA.

<u>Additionality demonstration of the CPA</u>

According to eligibility criteria (7) for inclusion of a SSC-CPA in the PoA described in the Section B.2, the activity included in the proposed CPA could be proved additional via any of the following three approaches, and the CPA could be proved additional only if all the activities included are additional.

1. **Meets relevant requirement in** in paragraph 2(a) and paragraph 4(a) of the **"*Guidelines for demonstrating additionality of microscale project activities*", including:**
   a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country;
   b) The total installed capacity of the CPA is no more than 15MW_{th} (for electricity generation, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM methodologies", then the total thermal installed capacity should meet this criteria);
   c) The emission reductions from type III components of the CPA is no more than 20 ktCO_2e per year.
2. **Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in** paragraph 2(c) of the **"*Guidelines on the demonstration of additionality of small-scale project activities*", including:**
   a) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);
   b) The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year;
   c) The installed capacity of each unit in the activities included in the CPA is less than 2,250 $KW_{th.}$
3. **The third method (Meets relevant requirement in "*General Guidelines to SSC CDM methodologies*", which also refer to "*Tool for the Demonstration and Assessment of Additionality" and "Guidelines on the Assessment of Investment Analysis",* including):**
   The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.

The additionality demonstration of each approach is as follows:

Approach (1)

According to paragraph 2(a) and paragraph 4(a) of the "*Guidelines for demonstrating additionality of microscale project activities*", Project activities up to five megawatts (or 15 MW_{th}) that employ renewable energy technology for Type 1, and up to 20,000 tCO_2e of annual emission reduction for Type III projects could be determined as additional directly.

Thus, the following table are applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the CPA under the PoA	Real situation of the CPA	Applicable? (Y/N)
1	The total installed capacity of the project is no more than $5MW_e$ ($15MW_{thermal}$). ($5MW_e \times 3$, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM Methodologies")	The total installed capacity of the CPA is no more than $5MW_e$ ($15MW_{thermal}$).		
2	The emission reductions from type III components of the project is no more than 20 $ktCO_2e$ per year .	The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year		
3	The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country.	The geographic location of the projects in the CPA is in a special underdeveloped zone of the P.R. China identified by the Government via any one of the following methods: a)The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50% calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; b)The GNI per capita in the country is less than USD 3000 and		

		the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures which is calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; c)Based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by EB of the CDM and published on the UNFCCC website.		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (2)

According to paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds.

According to CPA Eligibility criteria 3, the installed capacity and project size of all the activities included in the CPA are below the limitation of small-scale CDM projects. Thus, the following table is applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the activity in the CPA under the PoA	Real situation of the activity in the CPA	Applicable? (Y/N)
1	Project activities solely composed of isolated units	All the equipment units in the activity is solely		

	where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs)	isolated where the users are households or communities or Small and Medium Enterprises (SMEs)		
2	the size of each unit is no larger than 5% of the small-scale CDM	-The installed capacity of each unit for the Type I measure that employ renewable energy technology is no larger than 2.25MW (thermal); -The annual emission reduction of each unit for the Type III measure is no larger than 3,000 tCO_2e (thermal).		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (3)

According to the "*Guidelines on the demonstration of additionality of small-scale project activities*", following methods could be used for the demonstration of additionality:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The CPA is additional only if all the projects under the CPA are proved to be additional according to the paragraph 1(a) of "*Guidelines on the demonstration of additionality of small-scale project activities*":

Investment Barrier

Investment barrier analysis will be applied for all the projects under the CPA. The following steps in the "*Tool for the Demonstration and Assessment of Additionality*" will be applied:

Step 1 Determine appropriate analysis method

Step 2 Determine the benchmark

Step 3 Calculation and comparison of financial indicators

Step 4 Sensitivity analysis

Substep 1 Determine appropriate analysis method

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

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

Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. However, the project scenario of each CPA has more output service than the baseline scenario, thus they are not comparable. Therefore, the investment comparison analysis is not preferable.

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

Substep 2 Determine the benchmark

The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming. Only the CPA financial indicator is better than or equivalent to the benchmark, the project is economic attractive or financially feasible.

Substep 3 Calculation and comparison of financial indicators

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

Table 8.Financial Parameters of the CPA

No.	Parameter	Value	Units	Source
1	Static total investment		10,000RMB	
2	Total biogas generation		10,000m^3/year	
3	Annual total revenue		10,000RMB	
4	Project lifetime (include construction period)		years	
5	Annual O&M cost		10,000RMB	
6	Rate of VAT		%	
7	Rate of income tax		%	
8	Rate of city maintenance and construction tax		%	
9	Rate of education fee addition		%	
10	Annual CERs (emission reduction)		tCO_2e	
11	CERs price		EUR/tCO_2e	
12	Benchmark		%	

Generally values that were applied at the moment of the investment decision shall be used for the analysis above. Mostly, the Feasibility Study Report will be widely used in China.

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

Farm No.	IRR without CDM revenue	IRR with CDM revenue
LF0001		
……		
LFXXXX		

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 additional revenue is lower than the benchmark.

According to "Guidelines 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:

1)Static total investment
2)Annual revenue
- Annual biogas output
- Biogas sale price (incl. VAT)
- Annual power output
- Electricity purchase price (incl. VAT)
- Coal saving
- Coal price (incl. VAT)

3)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 four indicators varied in the range of -10%-+10%.

Table 9.Sensitivity analysis

	-10%	-5%	0%	5%	10%
Static total investment					
Annual revenue					
1)Annual biogas output					
2)Biogas sale price (incl. VAT)					
3)Annual power output					
4)Electricity purchase price (incl. VAT)					
5)Coal saving					
6)Coal price (incl. VAT)					
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.

Critical Analysis

LF0001	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	
LFXXXX	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	

Therefore, each activity in the CPA and the whole CPA is additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

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I. Calculate baseline emissions

Baseline emissions of the project include baseline emissions from methane and CO_2 emissions from energy generation in the absence of the CPA. Thus, the baseline emission is calculated as follows:

$$BE_y = BE_{CH4,y} + BE_{Thermal,y} + BE_{Ele,y} \quad (3\text{-}1)$$

Where:

BE_y Baseline emissions in year y (tCO_2e)

$BE_{CH4,y}$	Baseline emissions due to methane recovery in year *y* (tCO_2e)
$BE_{Thermal,y}$	Baseline emissions from thermal generation in year y (tCO_2e)
$BE_{Ele,y}$	Baseline emissions from electricity generation in year y (tCO_2e)

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

According to AMS-III.D, paragraph 9, $BE_{CH4,y}$ 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 9(a) is adopted in a CPA, which is as below:

$$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \quad (3\text{-}2)$$

Where:

$BE_{CH4,y}$	Baseline emissions due to biogas recovery in year *y* (tCO_2e)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (21)
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) 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)[16]

Determination of $B_{0,LT}$

According to AMS-III.D, 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 source. Since 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.

In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. The preferred method to obtain *VS* is to use data from nationally published sources. These values shall be compared with IPCC default values and any significant differences shall be explained. If data from nationally published sources are not available, country-specific *VS* excretion rates can be estimated from feed intake levels, via the enhanced characterisation method (tier 2) described in section 10.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. If 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;

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:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \qquad (3\text{-}3)$$

Where:

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

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

In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. Alternatively, the IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used.

Since the country-specific *MCF* is unavailable, the IPCC default values will therefore be adopted in the 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 observation.

Determination of $N_{LT,y}$

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

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right) \quad (3\text{-}4)$$

Where:

$N_{da,y}$	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 $BE_{Thermal,y}$

Thermal energy generation in the PoA includes, utilizing biogas as fuel of heating equipment for thermal energy generation and supplying biogas to households or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal.

$$BE_{thermal,y,} = BE_{thermal,y,1} + BE_{thermal,y,2} \quad (3\text{-}5)$$

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 project activity using renewable biogas for households or commercial applications/systems,

whose maximum output capacity is less than 45 kW thermal during the year *y* (tCO_2e)

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

$$BE_{thermal,y,1} = [EG_{PJ,y} / \eta_{BL,thermal}] * EF_{FF,CO2} \quad (3\text{-}6)$$

Where:

$BE_{thermal,y,1}$	The baseline emissions from steam/heat displaced by the CPA during the year *y* (tCO_2)
$EG_{PJ,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
$\eta_{BL,thermal}$	Efficiency of the baseline equipment being replaced (determined as per paragraph 30)
$EF_{FF,CO2}$	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)

As per AMS-I.C., Efficiency of the baseline units (excluding cogeneration plants) shall be determined by adopting one of the following criteria (in preferential order):

(a) Highest measured operational efficiency over the full range of operating conditions of a unit with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards;
(b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, using the baseline fuel;
(c) Default efficiency of 100%.

As the data described in option (a) or (b) is not available, option (c) default efficiency of 100% is adopted.

For household or commercial applications/systems, 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 biomass stoves, gasifiers, driers, water heaters etc, the project output energy shall be estimated based on consumption of the biomass (in terms of energy quantity) times the efficiency of the project equipment. The equation below shall be used:

$$\begin{aligned} BE_{thermal,y,2} &= [HG_{PJ,y} / \eta_{BL}] * EF_{FF,CO2} \\ &= \{[B_{biomass,PJ,y} * NCV_{biomass} * \eta_{PJ}] / \eta_{BL}\} * EF_{FF,CO2} \end{aligned} \quad (3\text{-}7)$$

Where:

$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the project activity using renewable biogas for household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal 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)
η_{BL}	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
$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline (tCO_2/TJ)
$B_{biomass,PJ,y}$	The net quantity of the biogas consumed by households in year *y* (tons)
$NCV_{biomass}$	The net calorific value of the biogas (TJ/tons)

The efficiency of the biogas-fired stoves is taken to be 55%. This corresponds to the efficiency requirements of biogas stoves and cookers according to the *National Standards of China for Domestic Biogas Stove (GB/T 3606-2001)*. The biogas-fired products with lower efficiency are not eligible to enter in the market. Products compliance with the National Standards is inspected during manufacturing by the certified authority. This is conservative.

According to AMS-I.C., for household or commercial applications/systems, 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 cooking stoves, gasifiers, driers, water heaters etc., efficiency of the baseline units shall be determined by adopting one of the following criteria:

(a) Highest measured operational efficiency over the full range of operating conditions of a representative sample of units with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards;

(b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications using the baseline fuel;

(c) Highest efficiency from referenced literature values or default efficiency of 100%.

As no data on this value is available, option (c) default efficiency of 100% is adopted.

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

According to AMS-I.D and AMS-I.F, $BE_{Ele,y}$ should be calculated as below:

$$BE_{\mathrm{Ele},y} = EG_{Ele,y} \times EF_{grid,CM,y} \quad (3\text{-}8)$$

Where:

$EG_{Ele,y}$ *Quantity of net electricity generated by the project activity in year y (MWh/yr)*

$EF_{grid,CM,y}$ *Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system";*

II. Calculate project emissions

According to AMS-III.D, 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 ($PE_{storage,y}$)

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (3\text{-}9)$$

Where:

PE_y Project emissions 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.AO (tCO_2e)

$PE_{storage,y}$ Emissions from the storage of manure (tCO_2e)

Determination of $PE_{PL,y}$

According to AMS-III.D, $PE_{PL,y}$ is calculated as follows:

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (3\text{-}10)$$

Where:

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

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 formulae below:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (3\text{-}11)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the biogas in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h (kg/h)
$\eta_{flare,h}$	Flare efficiency in hour h; 0 is used for this parameter. This is conservative.
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (3\text{-}12)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h; (kg/h)
$FV_{RG,h}$	Volumetric flow rate of the biogas in dry basis at normal conditions in hour h;(m^3/h)
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the biogas on dry basis in hour h; The default value of 60% will be used.
$\rho_{CH4,n}$	Density of methane at normal conditions (0.716); (kg/m^3)

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

As fossil fuel is not involved in the CPA, $PE_{power,y}$ is equivalent to project emissions from electricity consumption. According to AMS-III.D, project emissions from electricity consumption are determined as per the procedures described in AMS-I.D, which is calculated as below:

$$PE_{power,y} = EC_{ele,PJ,y} \times EF_{grid,CM,y} \quad (3\text{-}13)$$

Where:

$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the Project in year *y* (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*";

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

According to the*"Tool to calculate the emission factor for an electricity system",* The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin"(OM) and "build margin"(BM) as well as the "combined margin"(CM).

The tool provides procedures to determine the following parameters:

Parameter	Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

The following is the detailed process of calculating the baseline CO_2 emission factor of the grid which the Project connected to according to the steps provided by the *Tool to calculate the emission factor for an electricity system (*hereafter referred to as the *Tool).*

Sub-step 1. Identify the relevant electricity system.

Chinese DNA has published a delineation of the project electricity system and connected electricity system. The project physically connects through transmission and distribution lines to the East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province, the project boundary also includes power plants connected to ECPG or SCPG.

Project Location	Power gird	Local power grids
Anhui and Jiangsu Province	East China Power Grid (ECPG)	Shanghai City, Jiangsu, Zhejiang, Anhui, Fujian Province
Yunnan Province	Southern China Power Grid (SCPG)	Guangdong, Guangxi, Yunnan, Guizhou, Hainan Province

Sub-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.

Since the data of the off-grid power plants is not available, Option I is applied to calculate the operating margin and build margin emission factor.

Sub-step 3. Select a method to determine operating margin (OM).

According to the *Tool*, four methods compute the Operating Margin Emission factor can be used as follows:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of

total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. If the dispatch data is available the (c) Dispatch Data Analysis OM method should be the first methodological choice, while in case of the Project, the (a) Simple OM method is adapted with two reasons as follows:

(1)In cases where China presently the power grid dispatch and load data are unavailable as business secrets, so (b) and (c) cannot apply in the Project for calculating the Operating Margin Emission Factor ($EF_{grid,OM,y}$).

(2)In the five most recent years from 2006 to 2010, the low-cost/must run resources[17] constituted less than 50%[18] of total power generation of the grid. As a result, the simple OM method can be used to calculate the operating margin emission factor 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.

Sub-step 4. Calculate the operating margin emission factor according to the selected method.

From the *Tool to calculate the emission factor for an electricity system*, ($EF_{grid,simple,OM}$) may be calculated:

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

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.

Because the fuel consumption data is unavailable for each power plant / unit, Operation A cannot be used. At the same time 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 so Option B was the only operation can be used.

Where Option C is used, the simple OM method formula of $EF_{Grid,OM,Simple,y}$ calculation is:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \quad (3\text{-}14)$$

where:

$EF_{grid,OMsimply,y,}$ simple operating margin CO_2 emission factor in year y(tCO_2/MWh)；

$FC_{i,y}$ amount of fossil fuel type i consumed in the project electricity system in year y ；

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

[17] 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.

[18] For ECPG, the ratios are 38.18%, 35.26%, 35.47%, 39.42% and 38.40% from 2006 to 2010 respectively. For SCPG, the ratios are 28.61%, 27.14%, 27.89%, 34.50% and 30.91% from 2006 to 2010 respectively.

$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ) and
EG_y	net electricity generated and delivered to the grid by power plant / unit m in year y (MWh);
i	all fossil fuel types combusted in power sources in the project electricity system in year y;
y	either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

When there exists net electricity imports from a connected electricity system within the same host country(ies):

(1) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(2) the emission factor of the exporting grid, if the specific plants are not clearly known.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2008 to 2010 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2, Chap 1, Page 1.21-1.24.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,OM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.8367** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.9489** tCO_2/MWh

Sub-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.

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 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.

The PDD choose Option 1.

According to the *Tool*, the following equation (11) is adopted to calculate .

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3\text{-}15)$$

where:

$EF_{grid,BM,y}$ build margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{m,y}$ net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m power units included in the build margin;

y most recent historical year for which power generation data is available;

Consider of data availability, The Project adopted the following deviation method which was published by Chinese DNA and accepted by CDM EB[19]:

1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.

2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

(1) Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (3\text{-}16)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (3\text{-}17)$$

[19] http://cdm.unfccc.int/Projects/Deviations ; DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China"

$$\lambda_{Gas,\,y} = \frac{\sum_{i \in GAS,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{iy} \times EF_{i,\,j,\,y}} \quad (3\text{-}18)$$

where:

$F_{i,j,y}$ the amount of fuel i (in a mass or volume unit) consumed by power j in year(s) y;

NCV_{ij} Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*;

$EF_{i,j,y}$ the CO_2 emission coefficient of fuel i (tCO2/GJ);

(2) Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China

$$EF_{Thermal,\,y} = \lambda_{Coal,\,y} \times EF_{Coal,\,Adv,\,y} + \lambda_{Oil,\,y} \times EF_{Oil,\,Adv,\,y} + \lambda_{Gas} \times EF_{Gas,\,Adv,\,y} \quad (3\text{-}19)$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas.Adv,y}$ represents the efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,\,BM,\,y} = \frac{CAP_{Thermal,\,y}}{CAP_{Total,\,y}} \times EF_{Thermal,\,y} \quad (3\text{-}20)$$

Where $CAP_{Total,y}$ $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid*, the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2009 (311.5 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (237.4 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,BM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.6622** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.3157** tCO_2/MWh

Sub-step 6. Calculate the combined margin emissions factor.

Based on the *Tool to calculate the emission factor for an electricity system*, the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,\,y}$)

and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y} \quad (3\text{-}21)$$

According to the *Tool to calculate the emission factor for an electricity system*, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.74945** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.6323** tCO_2/MWh

Determination of $PE_{transp,y}$

According to AMS-III.AO, the emissions from incremental transportation are calculated as below:

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (3\text{-}22)$$

Where:

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)

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:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l} \left[\frac{365}{AI_l} \sum_{d=1}^{AI} (N_{LT,y} * VS_{LT,d} * MS\%_l * (1 - e^{-k\,(AI_l - d)}) * MCF_l * B_{0_{LT}}) \right] \quad (3\text{-}23)$$

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
MCF_l	Annual methane conversion factor for the project manure storage device l from Table 10.17, Chapter 10, Volume 4

III. Calculate Leakage emissions

No energy generating equipment is transferred from outside the boundary to the PoA. In addition, the collection/processing/transportation of animal manure is inside the project boundary. As per AMS-III.D., AMS-I.F. and AMS-I.C., leakage can be neglected.

IV. Calculate Emission Reductions

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

$$ER_y = BE_y - PE_y \quad (3\text{-}24)$$

Where:

ER_y	Emission reductions in year *y* (tCO_2e)

According to AMS-III.D, 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 from methane recovery in any year are the lowest value of the following:

$$ER_{CH4,y,ex\,post} = \min[(BE_{CH4,y,ex\,post} - PE_{CH4,y,ex\,post}), (MD_y - PE_{power,y,ex\,post})] \quad (3\text{-}25)$$

Where:

$ER_{CH4,y,ex\,post}$	Emission reductions achieved from methane recovery based on monitored values for year *y* (tCO_2e)
$BE_{CH4,y,ex\,post}$	Baseline emissions calculated using equation 1 of AMS-III.D (for projects using option in paragraph 9 (a)) using *ex post* monitored values of $N_{LT,y}$
$PE_{CH4,y,ex\,post}$	Project emissions calculated using equation 5 of AMS-III.D using *ex-post* monitored values of $N_{LT,y}$, $MS\%_{i,y}$, $MS\%_l$, AI_l, $Q_{res\ waste,y}$ 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 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:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \quad (3\text{-}26)$$

Where:

$BG_{burnt,y}$	The amount of biogas utilized in year y (m^3)
$w_{CH4,y}$	Methane content in biogas in the year y (volume fraction)
FE	Flare efficiency of biogas utilized for energy generation in year (fraction, 100% is applied, determined by paragraph 22 of AMS-III.D)

In conclusion, emission reductions from energy generation are summarized as below:

$$ER_{y,ex\ post} = ER_{CH4,\ y,ex\ post} + BE_{Ele,\ y} + BE_{thermal,y} \quad (3\text{-}27)$$

Where:

$ER_{y,ex\ post}$	Emission Reductions based on monitored values for year y (tCO_2e)
$ER_{CH4,\ y,ex\ post}$	Emission reductions achieved from methane recovery based on monitored values for year y (tCO_2e)
$BE_{Thermal,y}$	Baseline emissions from thermal generation in year y (tCO_2e)
$BE_{Ele,\ y}$	Baseline emissions from electricity generation in year y (tCO_2e)

B.6.2. Data and parameters that are to be reported ex-ante(Copy this table for each data and parameter.)

(Copy this table for each data and parameter.)

Data / Parameter	MCF_j
Unit	%
Description	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data	IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	For the MCF value, country-specific MCF values are not available, so he IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 was used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.
Additional comment	-

Data / Parameter	$B_{O,LT}$
Unit	$m^3/CH_4/kg$ dm
Description	Maximum methane producing potential of the volatile solid generated for animal type "LT"
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	According to AMS-III.D, The maximum methane-producing capacity of the manure (Bo) varies by species and diet. Since country specific Bo 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. In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

Data / Parameter	$MS\%_{Bl,j}$
Unit	%
Description	Fraction of manure handled in baseline animal manure management system "j"
Source of data	FSR
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	All manure handled in baseline animal manure management.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$W_{default}$
Unit	kg
Description	Default average animal weight of a defined population
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	IPCC default value is credible data source. In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$VS_{default}$
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	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	IPCC default value is credible data source.IPCC default value is credible data source. In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	MCF_l
Unit	-
Description	Annual methane conversion factor for the project manure storage device *l*
Source of data	Table 10.17, Chapter 10, Volume 4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See individual CPA-DD
Choice of data or Measurement methods and procedures	According to the Methodology AMS-III.D., IPCC default value should be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$fv_{CH4,RG,h}$
Unit	-
Description	Volumetric fraction of methane in the residual gas on dry basis in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	60%
Choice of data or Measurement methods and procedures	A default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$w_{CH4,y}$
Unit	-
Description	Methane content in biogas in the year *y*
Source of data	AMS-III.D.
Value(s) applied	60%
Choice of data or Measurement methods and procedures	According to AMS-III.D., a default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$EF_{FF,CO2}$
Unit	tCO_2/GJ
Description	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter 1, table 1.4
Value(s) applied	0.0873
Choice of data or Measurement methods and procedures	The value of Brown coal briquettes is used in the proposed PoA, as: 1)The value of Brown coal briquettes is the lowest one among all type of coal stated in the IPCC. 2)The lower limit of 95% confidence interval is adopted for more conservative. Thus, the adopted value is reasonable and conservative.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$\eta_{BL,thermal}$
Unit	-
Description	Efficiency of the baseline equipment being replaced
Source of data	AMS-I.C.
Value(s) applied	100%
Choice of data or Measurement methods and procedures	As per AMS-I.C., Efficiency of the baseline units (excluding cogeneration plants) shall be determined by adopting one of the following criteria (in preferential order): (a) Highest measured operational efficiency over the full range of operating conditions of a unit with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards; (b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, using the baseline fuel; (c) Default efficiency of 100%. As the data described in option (a) or (b) is not available, option (c) default efficiency of 100% is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{BL}
Unit	-
Description	Efficiency of the baseline equipment being replaced
Source of data	AMS-I.C.
Value(s) applied	100%
Choice of data or Measurement methods and procedures	According to AMS-I.C., for household or commercial applications/systems, 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 cooking stoves, gasifiers, driers, water heaters etc., efficiency of the baseline units shall be determined by adopting one of the following criteria: (a) Highest measured operational efficiency over the full range of operating conditions of a representative sample of units with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards; (b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications using the baseline fuel; (c) Highest efficiency from referenced literature values or default efficiency of 100%. As no data on this value is available, option (c) default efficiency of 100% is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{PJ}
Unit	-
Description	Efficiency of the biogas-fired stove.
Source of data	National Standards of China
Value(s) applied	55%
Choice of data or Measurement methods and procedures	The efficiency of the biogas-fired stoves η_{PJ} is taken to be 55 %. This corresponds to the efficiency requirements of biogas stoves and cookers according to the National Standards of China for Domestic Biogas Stove (GB/T 3606-2001). The biogas-fired products with lower efficiency are not eligible to enter in the market. Products compliance with the National Standards is inspected during manufacturing by the certified authority. This is conservative.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{flare}
Unit	-
Description	Flare efficiency in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0
Choice of data or Measurement methods and procedures	0 is used for this parameter. This is conservative.
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the flaring is involved

Data / Parameter	EF_{CO2}
Unit	tCO_2/km
Description	CO_2 emission factor from fuel use due to transportation
Source of data	Since there is no such parameter in IPCC 2006 Guidelines, thus the value in IPCC 1996 is applied
Value(s) applied	0.001011
Choice of data or Measurement methods and procedures	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the material transportation is involved

Data / Parameter	$\rho_{CH4,n}$
Unit	kg/m^3
Description	Density of methane at normal conditions
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	Tool to determine project emissions from flaring gases containing methane
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$NCV_{biomass}$
Unit	GJ/m^3
Description	The net calorific value of the biogas
Source of data	Refer to AMS-I.I
Value(s) applied	0.0215
Choice of data or Measurement methods and procedures	Refer to AMS-I.I., for biogas, use default value: 0.0215 GJ/m^3 biogas (assuming NCV of the methane: 0.0359 GJ/m^3, default methane content in biogas: 60%)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data	*China Electric Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$FC_{i,y}$
Unit	mass or volume unit

Description	Amount of fossil fuel type i consumed in the project electricity system in year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$F_{i,j,y}$
Unit	Mass or volume
Description	The fuel consumption of fuel i in power plant j during year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$NCV_{i,y}$
Unit	TJ/t, TJ/km^3
Description	Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*
Source of data	*China Energy Statistical Yearbook, 2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ (tCO_2e/TJ)
Description	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
Source of data	*IPCC 2006 Revised Guidelines*

Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$OXID_{i,y}$
Unit	%
Description	Oxidation factor of the fuel *i* in year *y*
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	**Internal use rate of power plant**
Unit	%
Description	The internal power consumption of power plants in year(s) *y*
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$CAP_{i,j,y}$
Unit	MW
Description	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.

Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Coal,\ Adv}$
Unit	%
Description	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	39.65%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Oil,\ Adv}$
Unit	%
Description	The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Gas,\ Adv}$
Unit	%
Description	The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%

Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Reasonable

Data / Parameter	**$EF_{grid,CM,y}$**
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the .Tool to calculate the emission factor for an electricity system.
Source of data	As per the "Tool to calculate the emission factor for an electricity system."
Value(s) applied	Official data

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	0.74945 tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	0.6323 tCO_2/MWh

Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system."
Purpose of data	Calculation of baseline and project emissions
Additional comment	Office data

B.6.3. Ex-ante calculations of emission reductions

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The ex-ante emission reduction calculations will be done in each specific CPA-DD on the basis of the equations in section B.6.1. above and the option chosen as per the EF tool during the process of inclusion of a CPA in the PoA.

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA
(Copy this table for each data and parameter)

Data / Parameter	W_{site}
Unit	kg
Description	Average animal weight of a defined livestock population at the CPA site
Source of data	Farm Owners
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Farm owners will measure weight of livestock alive with mass scale and calculate the average in a project year.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	nd_y
Unit	day
Description	Number of days in year "y" where the animal manure management system is operational.
Source of data	Assumed 365 days in the CPA, actual data is from the measurement.
Value(s) applied	365
Measurement methods and procedures	The data is obtained from the operation records of the animal manure management system as the sum of operation hours.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{da,y}$
Unit	Number
Description	Number of days animal is alive in the farm in the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{p,y}$
Unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{i,y}$
Unit	%
Description	Fraction of manure handled in system *i* in year *y*
Source of data	The farm owners, all manure handled in CPA animal manure management.
Value(s) applied	The data used in the CPA is come from the farm owners, the actual data should be monitored annually based on monthly records.
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{l}$
Unit	-
Description	Fraction of volatile solids (%) handled by storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	AI_l
Unit	-
Description	Fraction of volatile solids (%) handled by storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-treated in the year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$Q_{y,treatment}$
Unit	tonnes
Description	Quantity of compost produced in year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$CT_{y,treatment}$
Unit	tonnes/truck
Description	Average truck capacity for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$DAF_{treatment}$
Unit	km/truck
Description	Average distance for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$B_{biomass-1,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas supplied to heating equipment in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meter installed at the inlet of the heating equipment.
Monitoring frequency	-
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$B_{biomass-2,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas consumed by households in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meters installed at the inlet of gas line network.
Monitoring frequency	
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.

Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$B_{biomass\text{-}3,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas supplied to power generator in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meter installed at the inlet of the generator.
Monitoring frequency	
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas combusted in year "y"
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by flow meter
Monitoring frequency	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$FV_{RG,h}$
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
Source of data	Onsite measurement by flow meter
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Biogas sent to the flare will be monitored through the use of biogas flow meter continuously and reported cumulatively on weekly basis.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter will only be monitored when there is surplus gas from the Project and a flare is installed. The flow meter will undergo maintenance/calibration annually subject to appropriate industry standards by qualified entity.

Data / Parameter	P_{PJ}
Unit	Pa
Description	Pressure of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The pressure of the biogas will be recorded daily using manometer and monthly averaged.
Monitoring frequency	–
QA/QC procedures	The manometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	T_{PJ}
Unit	^oC
Description	Temperature of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The temperature of the biogas will be recorded daily using thermometer and monthly averaged.
Monitoring frequency	-

QA/QC procedures	Thermometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{PJ,y}$
Unit	TJ/yr
Description	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
Source of data	The data used in the CPA is come from the FSR, the actual data should be monitored annually based on continuous monitoring and monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The temperature, pressure and flow of steam provided by the CPA, will be measured by thermograph, flow-meter and manometer. Then the enthalpy of the steam will be determined. The net thermal energy generated by the Project will be available by the enthalpy of the steam deducting the known enthalpy of the inlet water. 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 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. In case of equipment that produces hot water/oil this is expressed as difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient.s end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient.
Monitoring frequency	The meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{ele,y}$
Unit	MWh/year
Description	Quantity of net electricity generated by the CPA in year *y*Average distance for compost transportation
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Electricity meters should be installed to measure the quantity of the electricity generated by the CPA in year y.
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions

Data / Parameter	$EC_{ele,PJ,y}$
Unit	MWh/year
Description	Quantity of net electricity consumed by the CPA in year *y*
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Electricity meters should be installed to measure the quantity of the electricity consumed by the CPA in year y.
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers. At the same time the invoice should be used for verification.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	**Operation of the household biogas stoves**
Unit	-
Description	Continuous operation of the household biogas stoves
Source of data	FSR, and the actual information should be assessed
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annual check of all appliances thereof to ensure that they are still operating or are replaced by an equivalent in service appliance. In the case of household or commercial applications/systems, 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: (i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute), if necessary using survey methods; (ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

Data / Parameter	Soil application of the residue waste
Unit	-
Description	Soil application (not resulting in methane emissions) of the residual waste.
Source of data	The actual information should be accessed through onsite check
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The soil application when the final sludge used will be monitored and recorded by the project owner.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

B.7.2. Description of the monitoring plan for a generic 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 project owner

is responsible for the implementation of the monitoring plan, and the consumers cooperate with the project owner.

1.Monitoring Parameters

Data/parameters needed to be monitored are listed below in the table:

No.	Data/Parameter	Description	Source of data	Record Frequency
1	W_{site}	Average animal weight of a defined livestock population at the CPA site	Farm Owners	-
2	nd_y	Number of days in year "y" where the animal manure management system is operational.	Farm Owners	-
3	$N_{da,y}$	Number of days animal is alive in the farm in the year y	Farm Owners	monthly
4	$N_{p,y}$	Number of animals produced annually of type LT for the year y	Farm Owners	monthly
5	$MS\%_{i,y}$	Fraction of manure handled in system *i* in year *y*	Farm Owners	monthly
6	$MS\%_{l}$	Fraction of volatile solids (%) handled by storage device *l*	Farm Owners	monthly
7	AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device *l*	Farm Owners	monthly
8	Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year	Farm Owners	daily
9	$Q_{y,treatment}$	Quantity of compost produced in year	Farm Owners	daily
10	CT_y	Average truck capacity for transportation	Farm Owners	monthly
11	$CT_{y,treatment}$	Average truck capacity for compost transportation	Farm Owners	monthly
12	DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation	Farm Owners	monthly
13	$DAF_{treatment}$	Average distance for compost transportation	Farm Owners	monthly
14	$B_{biomass-1,PJ,y}$	The net quantity of the biogas supplied to heating equipment in year *y*	Flow meter	Continuously
15	$B_{biomass-2,PJ,y}$	The net quantity of the biogas consumed by households in year y	Flow meter	Continuously
16	$B_{biomass-3,PJ,y}$	The net quantity of the biogas supplied to power generator in year *y*	Flow meter	Continuously
17	$BG_{burnt,y}$	Biogas combusted in year "y"	Flow meter	Continuously
18	$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	Flow meter	Continuously
19	P_{PJ}	Pressure of the biogas at the flow measurement site	manometer	daily
20	T_{PJ}	Temperature of the biogas at the flow measurement site	Thermometer	daily
21	$EG_{PJ,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)	Heat metering system	Continuously
22	$EG_{Ele,y}$	Quantity of net electricity generated by the CPA in year *y*	Electricity meter	Continuously
23	$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the Project in year y	Electricity meter	Continuously
24	Operation of the household biogas stoves	Continuous operation of the household biogas stoves	Farm Owners	-
25	Soil application of the residue waste	Soil application (not resulting in methane emissions) of the residual waste.	Farm Owners	-

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

The coordinating/managing entity opts for a verification method that does not use sampling. Each CPA will be monitored and verified.

2.Monitoring organization

In order to implement the monitoring plan effectively, the specific person in charge of the CPA is designated by CME to make sure the implementation of monitoring plan and keep in touch with EB, DNA and other relevant parties. The monitoring structure is clearly shown in the following figure.

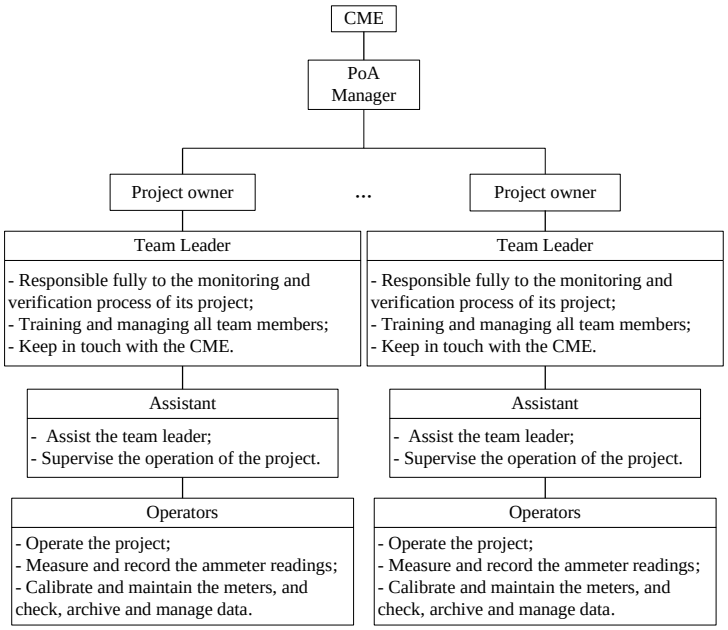

Figure 12.Monitoring team organization

Position	Responsibility description
PoA manager	PoA manager is designated by CME and is in full charge of monitoring and issues related to PoA, in particular: (1) Track the development of POA; keep communication with EB, DNA and related agencies; (2) Establish the monitoring plan and training plan. (3)Collect the data, and supervise implementation of the PoA.
Project Owner	Take in charge of operation and management of project activity, as well as assist PoA manager to conduct monitoring plan according to *Management and Monitoring Manual*.
Monitoring team	Designated by the project owner, and take in charge of monitoring implementation and the data collection according to the *Management and Monitoring Manual*.

All data will be bottom-up collected and reported as shown in monitoring structure and finally reported to CME.

This monitoring plan will be carried out by each monitoring team of each livestock farm under the supervision of the CME, designated by the livestock farm owner, 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 such as receipts of biogas sales.

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.

3.Installation of monitoring equipments

Flow metering systems will be installed in the location 6, 7 and 8 respectively to monitor the biogas supplied to 1) power generation system, 2) livestock farm(s), and/or nearby residents, and if available, 3) the flaring system; and, electricity metering system will be installed in the location 6 to monitor the electricity generated for captive use; and Heat metering system will be installed in location 7 to monitor the heat generated by biogas heating equipment supplied to livestock farm(s) and/or nearby residents; if available, electricity metering system will be installed in the location 5 to monitor the electricity from power grid consumed by the project activity (ies).

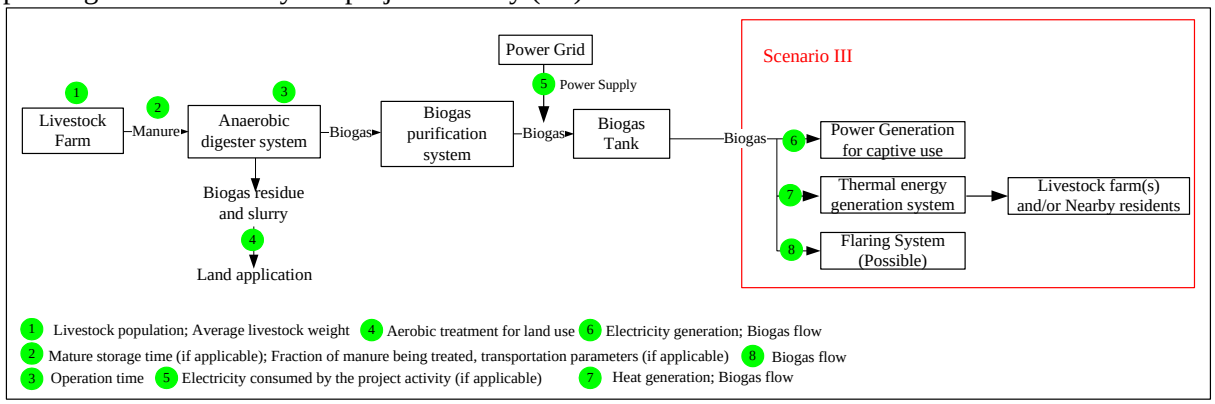

Figure 13.Monitoring system for project scenario

4.Data Collection and Management

All data continuously measured are transmitted to the CME (Each activity owner will take responsibility for data collection). The regular summary should be made and reported to technology department by statistician periodically; all the data after internal validation should be saved up to 2 years after the end of the crediting period.

5.QA/QC

Equipments 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. Once measuring equipment is in fault, it shall be replaced immediately with another calibrated measuring equipment by a professional engineer. During the period of erroneous measurement and replacement of the fault meter, a conservative method that can cause a lower CER value will be used.

If the error of data is caused by accidents during the crediting period, the project owner(s) 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.

6.Training

Before the formal operation of each activity, the person in charge of the CPA will organize the relevant personals to participate the CDM training.

7.Verification

The verification of emission reduction is carried out based on CME's requirements. The CME should provide DOE documents and evidence related to monitoring.

This Part IV is for the project activities that follow the Scenario IV.

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The purpose of the CPA is to enable livestock farmers in Anhui Province, Jiangsu Province and Yunnan Province to install animal manure treatment systems with recovery of biogas and the utilization of the generated biogas as fuel for **generate electricity only**, and electricity generated will be **delivered to the Power Gird**.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The following methodologies are applied in the PoA:

AMS-III.D.:	***"Methane recovery in animal manure management systems"* (Ver 18.0);**
AMS-I.D.:	***"Grid connected renewable electricity generation" (Ver 17.0).***

For more information, please refer to:

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

Those methodologies also refer to:

AMS-III.AO.: Methane recovery through controlled anaerobic digestion (Ver 1.0)
Tool to calculate the emission factor for an electricity system (Ver 02.2.1);
Tool to determine project emissions from flaring gases containing methane (Ver 01);
Tool for the Demonstration and Assessment of Additionality (Ver 06.0.0);
Guidelines on the Assessment of Investment Analysis (Ver 05);
Guidelines for demonstrating additionality of microscale project activities (Ver 04.0);
Guidelines on the demonstration of additionality of small-scale project activities (Ver 09.0)
General Guidelines to SSC CDM methodologies (Ver 19.0);
Standard for Application of Multiple CDM Methodologies for a Programme of Activities (Ver 01.0);

For more information, please refer to:

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

According to methodologies above, each of them is approved for use in a PoA.

B.2. Application of methodology(ies)

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1.<u>Methodology of type III --- manure treatment and avoid methane emission part</u>

The project activities under the CPA of the PoA meet the applicability criteria of Methodology **AMS-III.D**. The details analysis on the applicability criteria of Methodology **AMS-III.D** is as the following table:

No.	Applicability Conditions as per AMS-III.D	Situation of a CPA under the PoA
1	The livestock population in the farm is managed under confined conditions;	The livestock in the Project Farm will be all managed under confined conditions, which can be confirmed through onsite check.
2	Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise AMS-III.H "Methane recovery in wastewater treatment" shall be applied;	Waste residue and liquid after treatment will be used as fertilizers, and therefore will not be 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;	According to the document or information of nearby meteorology bureau, the annual average temperature of baseline site will higher than 5°C.
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;	The manure waste is left to decay in the anaerobic lagoon. According to the size of anaerobic lagoons and daily amount of manure, it can be known the retention time of manure waste in the anaerobic treatment system; the depths of lagoon can be known based on the onsite check or the supporting documents provided by the third party, e.g. construction drawing of lagoon.
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	In the baseline scenario, methane from the lagoon will be directly released into atmosphere without any recovery, destruction or utilization activity through the onsite check or the supporting documents provided by the third party.
6	The residual waste from the animal manure management system 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 of the project will be handled aerobically and utilized as fertilizer, which will not result in methane emissions.
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	Biogas tank will be installed in each project activity to achieve that in case of emergency all methane produced from anaerobic digestion can be stored but not emitted to atmosphere, and therefore ensure that all methane produced by the digester is destroyed.

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 digester. 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.	Manure collected will be cleaned and transferred into the anaerobic digesters as soon as possible, which usually does not exceed one day.
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".	The project activities under the CPA do not involve landfill methane recovery, wastewater treatment, composting animal manure, or co-digestion of animal manure and other organic matters; therefore this is irrelevant.
10	Different options to utilise 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.	The recovered biogas will be used for generation of thermal, which belongs to option (a).
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".	Each project activity under the CPA is a newly built animal manure treatment system and they can meet the related and relevant requirements in the "*General Guidelines to SSC CDM methodologies*". The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "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".	Each project activity under the CPA is a newly built animal manure treatment system, thus this criterion is not relevant as replacement of equipment is not involved in a CPA under the PoA.
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.	The emission reduction sourced from methane recovery for each CPA will be lower than the threshold of 60,000 tCO_2e/yr. Therefore, the project is in line with "General Guidelines to SSC CDM methodologies".

Based on analysis above, AMS-III.D is applicable to the CPAs under the PoA.

2.<u>Methodology of type I --- renewable energy part</u>

The details analysis on the applicability criteria of Methodology **AMS-I.D.** is as the following table:

No.	Applicability Conditions as per AMS-I.D	Situation of **Scenario IV**
1	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a)Supplying electricity to a national or a regional grid; or (b)Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activities under CPA will use the biogas collected from the anaerobic manure management system to generate electricity, and the power will be supplied to the power grid. It belongs to option (a).
2	This methodology is applicable to 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 replacement3 of (an) existing plant(s).	All the project activities included in a CPA of the PoA are Greenfield plants. It belongs to option (a).
3	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.	N/A This criterion is not relevant because each project activity under the CPA is power generation based on biogas-fired.
4	If the new unit has both renewable and non-renewable 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 co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.
5	Combined heat and power (co-generation) systems are not eligible under this category.	N/A Combined heat and power (co-generation) systems is not involved in a CPA.
6	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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.

7	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.	N/A The proposal for the PoA is to install new facilities for biogas generation and utilization. Therefore, this applicability condition is not relevant.

According to analysis above, AMS-I.D. is applicable to the CPAs under the PoA.

According to Para 29(c) in Annex 3 "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (Version 01.0) of EB 65, combinations of methodologies mentioned above are eligible to be adopted in the PoA.

In conclusion, different combinations of methodologies will be used in the PoA according to the CPA scenario.

B.3. Sources and GHGs

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As per Methodology AMS-III.D, AMS-I.D, 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.

Furthermore, as the CPA will need to purchase electricity from Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province), the project boundary also includes power plants connected to ECPG or SCPG. Emissions sources included in or excluded from the project boundary are shown in the following Table.

Table 10.The emission source and the category of GHG

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the waste 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	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity generation	**CO_2**	**Included**	**The major source of emissions**
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	CO_2	Excluded	The CPA is not involved thermal generation.
		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	CO_2 emissions from the decomposition of organic waste are not accounted
		N_2O	Excluded	Excluded for simplification.
	Emissions from flaring or	CO_2	Excluded	Excluded for simplification.
		CH_4	**Included**	**The major source of emissions in case flaring is**

	combustion of the gas stream			**involved.**
		N_2O	Excluded	Excluded for simplification.
	Emissions from the use of fossil fuel or electricity	**CO_2**	**Included**	**The major source of emissions.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from incremental transportation distances	**CO_2**	**Included**	**In case of incremental transportation was occurred compared with project scenario and baseline scenario, This emissions are accounted.**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from the storage of manure before being fed into the anaerobic digester	**CH_4**	**Included**	**This source of emissions 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%.**
		CO_2	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.

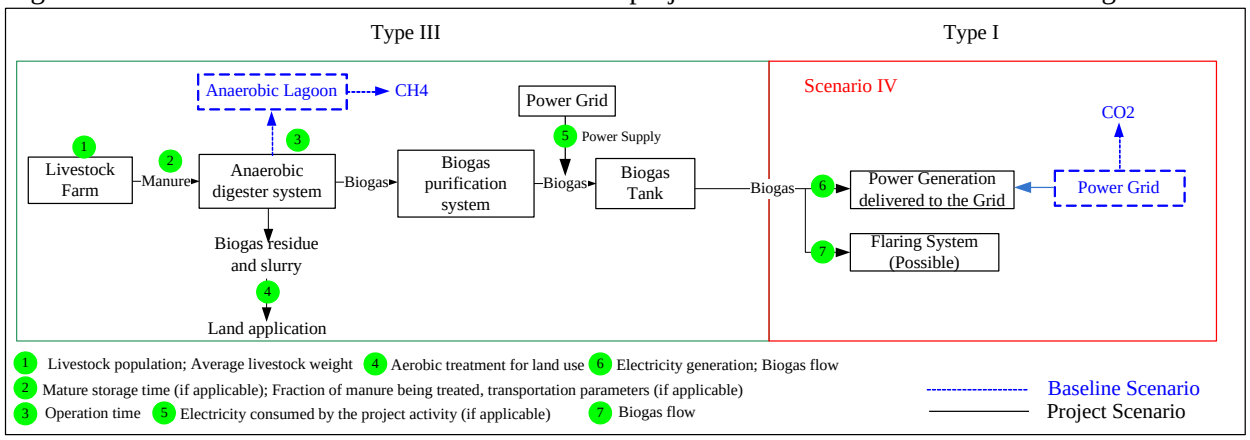

Figure 14.Project boundary

B.4. Description of baseline scenario

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1.Methodology of type III --- manure treatment and avoid methane emission part

As per AMS-III.D., 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.

2.Methodology of type I --- renewable energy part

As per AMS-I.D, the baseline of electricity generation is that the equivalent electricity would be generated by Power Grid (East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province).

Therefore, it can be concluded from above that, the baseline scenario for a CPA is that, animal manure is treated anaerobically without methane recovery and destruction, and the equivalent electricity is generated based on ECPG or SCPG.

B.5. Demonstration of eligibility for a generic CPA

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The CPA is eligible for inclusion in the PoA because it meets all of the criteria outlined in section B.2 of Part I of PoA-DD:

No.	Eligibility criteria	Situation of CPA	Evidence sample
1.	All the project activities under the CPA should be located in the boundary of the PoA, i.e. within Anhui Province or Jiangsu Province or Yunnan Province.	The livestock farms included in the CPA are located in XXX, XXX respectively, which are within Anhui Province or Jiangsu Province or Yunnan Province.	--FSR --Business license
2.	Each project activity owner under the CPA should sign a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	The potential individual project owner included in the proposed CPA has/will signed a contract with the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
3.	Every CPA in aggregate meets the small-scale criteria and remains within those thresholds throughout the crediting period of the CPA, i.e., The emission reductions from type III components of the CPA should be equal to or less than 60,000 tCO_2/y and the total installed/rated/added energy generation capacity of the CPA should be equal to or less than 15 MW_{ele}.	In the CPA, the emission reductions from type III components is XXX tCO_2/y, which is no more than 60,000 tCO_2/y, and the total installed/rated energy generation capacity of the project equipment is XX MW_{ele}/MW_{ther}, less than 15 $MW_{ele.}$	--FSR or FSR approval; --Equipment brand/ nameplate; or --Equipment purchase contract; --CPA lists --ER Calculation worksheet;
4.	The proposed small-scale CPA is not a debundled component of a large scale activity, 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, if the CPA will satisfy any of the conditions below: (a)Doesn't have the same activity owner as the proposed small scale CPA or doesn't have a	The proposed small-scale CPA cannot satisfy the following criteria at the same time : (a)Has the same activity owner as the proposed small scale CPA or has coordinating or managing entity, which also manages a large scale PoA of the same technology and. measure;	--FSR; --Documents from local government; --Onsite Survey.

	coordinating or managing entity, which also manages a large scale PoA of the same technology/measure Or (b)There is no any activity[20] with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.	(b)The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the cloest point. Therefore, the CPA is not a de-bundled component of a large activity;	
5.	The start date of the project activities under the CPA, which is the earliest date among equipment purchase date, debt contract date and construction start date, are later than the PoA GSC start date (14/06/2012).	The starting date of the CPA is decided by the starting date of each project activity included. The project activities' starting date are expected to be DD/MM/YYYY, which are after the GSP date, so it can be met.	--Equipment purchasing contract --Construction contract or construction start record
6.	The PoA start date is 01/02/2013, or the submission date of the PoA, whichever is earlier, so the CPA crediting period does not exceed 31/01/2040 (the PoA end date).	The end date of CPA crediting period is DD/MM/YYYY, which does not exceed the PoA end date.	--CPA-DD
7.	A CPA should meet any one of following criteria for assessing additionality: (a)Meets relevant requirements in paragraph 2(a) and (4a) of the *Guidelines for demonstrating additionality of microscale project activities*, including: ✓The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;country ✓ The total installed capacity of the CPA is no more than 15MW_{ther}; ✓The emission reductions from type III	The CPA meet the criterion (a/b) as described in the section B.5 below.	--ER Calculation worksheet --Income statement --IRR Calculation worksheet

[20] 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

	components of the CPA are no more than 20 ktCO_2e per year; (b) Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", including: ✓ Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs); ✓ The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year; ✓The installed capacity of each unit in the activities included in the CPA is less than 2,250 $kW_{th.}$ (c) The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.		
8.	The project activities under the CPAs are not sponsored by any funding from Annex I parties.	No public funding from Annex I parties have been provided;	--Project approval or --Confirmation by the project owner
9.	Each project activities included in the CPA must have obtained approval of EIA.	Each project activity included in the CPA have obtained approval of EIA.	--EIA and its approval

10.	Measures should be taken to avoid double counting of emission reductions for the CPA, like unique identifications of product and end-user locations (e.g. programme logo).		Each CPA and project activity have a unique identification as CPAXXXX and LFXXXX, and also, programme logo will be used to uniquely identify the product and end-user locations;	-- The contract between the project activity owner and the CME to confirm that: (a) The project activity owner are aware of and have agreed that their activity is being subscribed to the PoA; (b) The project activity have neither already been registered as a CDM project, nor as a CPA of another PoA.
11.	All the project activities under the CPA are to install new anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered biogas.		All activities under the CPA are to install new anaerobic reactors in livestock farms to achieve methane recovery and utilization.	-- FSR or FSR approval; --Technical flow figure
12.	The CPA complies with applicability and other requirements of applied methodologies. All relevant applicability criteria of methodology AMS-III.D shall be met; detailed analysis is conducted in section B.2 of Part II of PoA-DD. There are four scenarios for energy generation involved in the PoA as follows:		The applicability criteria of methodology AMS-III.D are met.	--On-site photo or --FSR or FSR approval --EIA or EIA approval --History Record of livestock farms --Statement by Related Agriculture Bureau --Technical demonstration --Official data at the nearest meteorological station, or -- Data available from historical on site observations
12.1	***Scenario I*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households..	The CPA under scenario I will satisfy the applicability of Methodology AMS-I.C; detailed analysis is conducted in section B.2 of Part II of PoA-DD.		N/A
12.2	***Scenario II*** The biogas produced	The CPA under scenario II		N/A

	by the project is used for generating electricity for captive use that displaces electricity from national or a regional grid.	will satisfy the applicability of Methodology AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.		
12.3	***Scenario III*** The biogas produced by the project is used for supplying thermal energy that displaces fossil fuel use for livestock farms and /or households. and for generating electricity for captive use that displaces electricity from national or a regional grid.	The CPA under scenario III will satisfy the applicability of Methodology AMS-I.C and AMS-I.F; detailed analysis is conducted in section B.2 of Part II of PoA-DD.		N/A
12.4	***Scenario IV*** The biogas produced by the project is used for generating electricity delivered to the national or a regional grid.	The CPA under scenario IV will satisfy the applicability of Methodology AMS-I.D; detailed analysis is conducted in section B.2 of Part II of PoA-DD.		The CPA is following ***Scenario IV and*** The applicability criteria of methodology AMS-I.D are met.

Additionality

<u>Considering CDM before the construction of the CPA</u>

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 (GSC date).

To demonstrate the additionality of each CPA, timeline of the main events involved in the implementation of each CPA will be stated to prove that the project owner took CDM into serious consideration before commencing the CPA. And the project owners have taken successive actions to secure the CDM application before the construction works for the CPA.

<u>Additionality demonstration of the CPA</u>

According to eligibility criteria (7) for inclusion of a SSC-CPA in the PoA described in the Section B.2, the activity included in the proposed CPA could be proved additional via any of the following three approaches, and the CPA could be proved additional only if all the activities included are additional.

1. **Meets relevant requirement in** in paragraph 2(a) and paragraph 4(a) of the **"*Guidelines for demonstrating additionality of microscale project activities*", including:**
   a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country;
   b) The total installed capacity of the CPA is no more than $15MW_{th}$ (for electricity generation, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM methodologies", then the total thermal installed capacity should meet this criteria);
   c) The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year.
2. **Meets relevant requirement for the positive list of technologies and project activity types that are defined as automatically additional in** paragraph 2(c) of the **"*Guidelines on the demonstration of additionality of small-scale project activities*", including:**
   a) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);
   b) The emission reductions from type III components of the CPA is no more than 3,000 tCO_2e per year;
   c) The installed capacity of each unit in the activities included in the CPA is less than 2,250 $KW_{th.}$
3. **The third method (Meets relevant requirement in "*General Guidelines to SSC CDM methodologies*", which also refer to "*Tool for the Demonstration and Assessment of Additionality" and "Guidelines on the Assessment of Investment Analysis",* including):**
   The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming as per paragraph 1(a) of the *Guidelines on the Demonstration of Additionality of Small-scale Project Activities*.

The additionality demonstration of each approach is as follows:

Approach (1)

According to paragraph 2(a) and paragraph 4(a) of the "*Guidelines for demonstrating additionality of microscale project activities*", Project activities up to five megawatts (or 15 MW_{th}) that employ renewable energy technology for Type 1, and up to 20,000 tCO_2e of annual emission reduction for Type III projects could be determined as additional directly.

Thus, the following table are applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the CPA under the PoA	Real situation of the CPA	Applicable? (Y/N)
1	The total installed capacity of the project is no more than $5MW_e$ ($15MW_{thermal}$). ($5MW_e \times 3$, multiply by 3 to derive thermal units as per the latest version of "General Guidelines to SSC CDM Methodologies")	The total installed capacity of the CPA is no more than $5MW_e$ ($15MW_{thermal}$).		
2	The emission reductions from type III components of the project is no more than 20 $ktCO_2e$ per year .	The emission reductions from type III components of the CPA is no more than 20 $ktCO_2e$ per year		
3	The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country.	The geographic location of the projects in the CPA is in a special underdeveloped zone of the P.R. China identified by the Government via any one of the following methods: a)The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50% calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; b)The GNI per capita in the country is less than USD 3000 and		

		the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures which is calculated by using the most recent available data in official notifications for development assistance including for planning, management, and investment; c)Based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by EB of the CDM and published on the UNFCCC website.		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (2)

According to paragraph 2(c) of the "*Guidelines on the demonstration of additionality of small-scale project activities*", project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds.

According to CPA Eligibility criteria 3, the installed capacity and project size of all the activities included in the CPA are below the limitation of small-scale CDM projects. Thus, the following table is applied to check whether or not the activities in the proposed CPA are applicable for this Approach on the additionality demonstration.

No.	Criteria in the guideline	Detailed criteria for the activity in the CPA under the PoA	Real situation of the activity in the CPA	Applicable? (Y/N)
1	Project activities solely composed of isolated units where the users of the technology/measure are	All the equipment units in the activity is solely isolated where the users are households or		

	households or communities or Small and Medium Enterprises (SMEs)	communities or Small and Medium Enterprises (SMEs)		
2	the size of each unit is no larger than 5% of the small-scale CDM	-The installed capacity of each unit for the Type I measure that employ renewable energy technology is no larger than 2.25MW (thermal); -The annual emission reduction of each unit for the Type III measure is no larger than 3,000 tCO_2e (thermal).		

The activity in the proposed CPA is additional if all the requirements are met.

Approach (3)

According to the "*Guidelines on the demonstration of additionality of small-scale project activities*", following methods could be used for the demonstration of additionality:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The CPA is additional only if all the projects under the CPA are proved to be additional according to the paragraph 1(a) of "*Guidelines on the demonstration of additionality of small-scale project activities*":

Investment Barrier

Investment barrier analysis will be applied for all the projects under the CPA. The following steps in the "*Tool for the Demonstration and Assessment of Additionality*" will be applied:

Step 1 Determine appropriate analysis method

Step 2 Determine the benchmark

Step 3 Calculation and comparison of financial indicators

Step 4 Sensitivity analysis

Substep 1 Determine appropriate analysis method

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

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

Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. However, the project scenario of each CPA has more output service than the baseline scenario, thus they are not comparable. Therefore, the investment comparison analysis is not preferable.

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

Substep 2 Determine the benchmark

The project IRR (before tax) of the project included in the CPA is lower than the benchmark (project IRR before tax) of 7% according to the *Economic Evaluation Method and Parameter of Construction Projects* (3rd edition) for the stock farming. Only the CPA financial indicator is better than or equivalent to the benchmark, the project is economic attractive or financially feasible.

Substep 3 Calculation and comparison of financial indicators

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

Table 11.Financial Parameters of the CPA

No.	Parameter	Value	Units	Source
1	Static total investment		10,000RMB	
2	Total biogas generation		10,000m^3/year	
3	Annual total revenue		10,000RMB	
4	Project lifetime (include construction period)		years	
5	Annual O&M cost		10,000RMB	
6	Rate of VAT		%	
7	Rate of income tax		%	
8	Rate of city maintenance and construction tax		%	
9	Rate of education fee addition		%	
10	Annual CERs (emission reduction)		tCO_2e	
11	CERs price		EUR/tCO_2e	
12	Benchmark		%	

Generally values that were applied at the moment of the investment decision shall be used for the analysis above. Mostly, the Feasibility Study Report will be widely used in China.

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

Farm No.	IRR without CDM revenue	IRR with CDM revenue
LF0001		
……		

LFXXXX		

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 additional revenue is lower than the benchmark.

According to "Guidelines 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:

1)Static total investment
2)Annual revenue
- Annual biogas output
- Biogas sale price (incl. VAT)
- Annual power output
- Electricity purchase price (incl. VAT)
- Coal saving
- Coal price (incl. VAT)

3)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 four indicators varied in the range of -10%-+10%.

Table 12.Sensitivity analysis

	-10%	-5%	0%	5%	10%
Static total investment					
Annual revenue					
1)Annual biogas output					
2)Biogas sale price (incl. VAT)					
3)Annual power output					
4)Electricity purchase price (incl. VAT)					
5)Coal saving					
6)Coal price (incl. VAT)					
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.

Critical Analysis

LF0001	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	

1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	
LFXXXX	
Item	When IRR=X%, Variation=
Static total investment	
Annual revenue	
1)Annual biogas output	
2)Biogas sale price (incl. VAT)	
3)Annual power output	
4)Electricity purchase price (incl. VAT)	
5)Coal saving	
6)Coal price (incl. VAT)	
Annual O&M cost	
Annual total biogas generation	

Therefore, each activity in the CPA and the whole CPA is additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

I. Calculate baseline emissions

Baseline emissions of the project include baseline emissions from methane and CO_2 emissions from energy generation in the absence of the CPA. Thus, the baseline emission is calculated as follows:

$$BE_y = BE_{CH4,y} + BE_{Ele,y} \quad (4\text{-}1)$$

Where:

BE_y	Baseline emissions in year *y* (tCO_2e)
$BE_{CH4,y}$	Baseline emissions due to methane recovery in year *y* (tCO_2e)
$BE_{Ele,y}$	Baseline emissions from electricity generation in year y (tCO_2e)

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

According to AMS-III.D, paragraph 9, $BE_{CH4,y}$ 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 9(a) is adopted in a CPA, which is as below:

$$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j} \qquad (4\text{-}2)$$

Where:

$BE_{CH4,y}$	Baseline emissions due to biogas recovery in year *y* (tCO_2e)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (21)
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) 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)[21]

Determination of $B_{0,LT}$

According to AMS-III.D, 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 source. Since country specific B_o values are not available, default values from tables

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

10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 can be used.

In the project case, IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. The preferred method to obtain *VS* is to use data from nationally published sources. These values shall be compared with IPCC default values and any significant differences shall be explained. If data from nationally published sources are not available, country-specific *VS* excretion rates can be estimated from feed intake levels, via the enhanced characterisation method (tier 2) described in section 10.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. If 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;

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:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \qquad (4\text{-}3)$$

Where:

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 the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

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. Alternatively, the IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used.

Since the country-specific *MCF* is unavailable, the IPCC default values will therefore be adopted in the 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 observation.

Determination of $N_{LT,y}$

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

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right) \quad (4\text{-}4)$$

Where:

$N_{da,y}$ 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 $BE_{Ele,y}$

According to AMS-I.D and AMS-I.F, should be calculated as below:

$$BE_{Ele,y} = EG_{Ele,y} \times EF_{grid,CM,y} \quad (4\text{-}5)$$

Where:

$EG_{Ele,y}$ *Quantity of net electricity generated by the project activity in year y (MWh/yr)*

$EF_{grid,CM,y}$ *Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system";*

Ⅱ. Calculate project emissions

According to AMS-III.D, 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 ($PE_{storage,y}$)

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (4\text{-}6)$$

Where:

PE_y	Project emissions 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.AO (tCO_2e)
$PE_{storage,y}$	Emissions from the storage of manure (tCO_2e)

Determination of $PE_{PL,y}$

According to AMS-III.D, $PE_{PL,y}$ is calculated as follows:

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (4\text{-}7)$$

Where:

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

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 formulae below:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (4\text{-}8)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the biogas in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h (kg/h)
$\eta_{flare,h}$	Flare efficiency in hour h; 0 is used for this parameter. This is conservative.
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (4\text{-}9)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the biogas in the hour h; (kg/h)
$FV_{RG,h}$	Volumetric flow rate of the biogas in dry basis at normal conditions in hour h;(m^3/h)

$fv_{CH4,RG,h}$ Volumetric fraction of methane in the biogas on dry basis in hour h; The default value of 60% will be used.

$\rho_{CH4,n}$ Density of methane at normal conditions (0.716); (kg/m^3)

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

As fossil fuel is not involved in the CPA, $PE_{power,y}$ is equivalent to project emissions from electricity consumption. According to AMS-III.D, project emissions from electricity consumption are determined as per the procedures described in AMS-I.D, which is calculated as below:

$$PE_{power,y} = EC_{ele,PJ,y} \times EF_{grid,CM,y} \quad (4\text{-}10)$$

Where:

$EC_{ele,PJ,y}$ Quantity of net electricity consumed by the Project in year *y* (MWh/yr)

$EF_{grid,CM,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*";

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

According to the *"Tool to calculate the emission factor for an electricity system",* The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin"(OM) and "build margin"(BM) as well as the "combined margin"(CM).

The tool provides procedures to determine the following parameters:

Parameter	Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

The following is the detailed process of calculating the baseline CO_2 emission factor of the grid which the Project connected to according to the steps provided by the *Tool to calculate the emission factor for an electricity system (*hereafter referred to as the *Tool).*

Sub-step 1. Identify the relevant electricity system.

Chinese DNA has published a delineation of the project electricity system and connected electricity system. The project physically connects through transmission and distribution lines to the East China Power Grid for projects located in Anhui and Jiangsu Province; Southern China Power Grid for projects located in Yunnan Province, the project boundary also includes power plants connected to ECPG or SCPG.

Project Location	Power gird	Local power grids
Anhui and Jiangsu Province	East China Power Grid (ECPG)	Shanghai City, Jiangsu, Zhejiang, Anhui, Fujian Province
Yunnan Province	Southern China Power Grid (SCPG)	Guangdong, Guangxi, Yunnan, Guizhou, Hainan Province

Sub-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.

Since the data of the off-grid power plants is not available, Option I is applied to calculate the operating margin and build margin emission factor.

Sub-step 3. Select a method to determine operating margin (OM).

According to the *Tool*, four methods compute the Operating Margin Emission factor can be used as follows:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. If the dispatch data is available the (c) Dispatch Data Analysis OM method should be the first methodological choice, while in case of the Project, the (a) Simple OM method is adapted with two reasons as follows:

(1)In cases where China presently the power grid dispatch and load data are unavailable as business secrets, so (b) and (c) cannot apply in the Project for calculating the Operating Margin Emission Factor ($EF_{grid,OM,y}$).

(2)In the five most recent years from 2006 to 2010, the low-cost/must run resources[22] constituted less than 50%[23] of total power generation of the grid. As a result, the simple OM method can be used to calculate the operating margin emission factor of the CPA.

To calculate the simple OM emission factor of the grid, the ex-ante option is adopted by using 3-year

[22] 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.

[23] For ECPG, the ratios are 38.18%, 35.26%, 35.47%, 39.42% and 38.40% from 2006 to 2010 respectively. For SCPG, the ratios are 28.61%, 27.14%, 27.89%, 34.50% and 30.91% from 2006 to 2010 respectively.

generation-weighted average based on the most recent data.

Sub-step 4. Calculate the operating margin emission factor according to the selected method.

From the *Tool to calculate the emission factor for an electricity system*, ($EF_{grid,simple,OM}$) may be calculated:

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

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.

Because the fuel consumption data is unavailable for each power plant / unit, Operation A cannot be used. At the same time 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 so Option B was the only operation can be used.

Where Option C is used, the simple OM method formula of $EF_{Grid,OM,Simple,y}$ calculation is:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \quad (4\text{-}11)$$

where:

$EF_{grid,OMsimply,y,}$ simple operating margin CO_2 emission factor in year y(tCO_2/MWh)；

$FC_{i,y}$ amount of fossil fuel type i consumed in the project electricity system in year y ；

$NCV_{i,y}$ 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 (tCO_2/GJ) and

EG_y net electricity generated and delivered to the grid by power plant / unit m in year y (MWh);

i all fossil fuel types combusted in power sources in the project electricity system in year y；

y either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

When there exists net electricity imports from a connected electricity system within the same host country(ies):

(1) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(2) the emission factor of the exporting grid, if the specific plants are not clearly known.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2008 to 2010 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China*

Energy Statistical Yearbook from 2008 to 2010 (published annually after 2003). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2, Chap 1, Page 1.21-1.24.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,OM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.8367** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.9489** tCO_2/MWh

Sub-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.

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 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.

The PDD choose Option 1.

According to the *Tool*, the following equation (11) is adopted to calculate .

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4\text{-}12)$$

where:

$EF_{grid,BM,y}$ build margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{m,y}$ net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m power units included in the build margin;

y most recent historical year for which power generation data is available;

Consider of data availability, The Project adopted the following deviation method which was published

by Chinese DNA and accepted by CDM EB[24]:

1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.

2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

(1) Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (4\text{-}13)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (4\text{-}14)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (4\text{-}15)$$

where:

$F_{i,j,y}$ the amount of fuel i (in a mass or volume unit) consumed by power j in year(s) y;

NCV_{ij} Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*;

$EF_{i,j,y}$ the CO_2 emission coefficient of fuel i (tCO2/GJ);

(2) Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} \quad (1\text{-}18)$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas.Adv,y}$ represents the efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

[24] http://cdm.unfccc.int/Projects/Deviations ; DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China"

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (4\text{-}16)$$

Where $CAP_{Total,y}$ $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2008 to 2010 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid,* the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2009 (311.5 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (237.4 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

The detailed calculation can be find in Annex 3.

Project Location	Power gird	$EF_{grid,BM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.6622** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.3157** tCO_2/MWh

Sub-step 6. Calculate the combined margin emissions factor.

Based on the *Tool to calculate the emission factor for an electricity system,* the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

(4-17)

According to the *Tool to calculate the emission factor for an electricity system*, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	**0.74945** tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	**0.6323** tCO_2/MWh

Determination of

According to AMS-III.AO, the emissions from incremental transportation are calculated as below:

$$PE_{transp,y}, = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (4\text{-}18)$$

Where:

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)

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:

(c) 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

(d) 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:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k\ (AI_l-d)}) * MCF_l * B_{0_{LT}})\right] \quad (4\text{-}19)$$

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
MCF_l	Annual methane conversion factor for the project manure storage device l from Table 10.17, Chapter 10, Volume 4

Ⅲ. Calculate Leakage emissions

No energy generating equipment is transferred from outside the boundary to the PoA. In addition, the

collection/processing/transportation of animal manure is inside the project boundary. As per AMS-III.D., AMS-I.D., leakage can be neglected.

Ⅳ. Calculate Emission Reductions

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

$$ER_y = BE_y - PE_y \quad (4\text{-}20)$$

Where:

ER_y	Emission reductions in year y (tCO_2e)

According to AMS-III.D, 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 from methane recovery in any year are the lowest value of the following:

$$ER_{CH4,y,ex\,post} = \min[(BE_{CH4,y,ex\,post} - PE_{CH4,y,ex\,post}), (MD_y - PE_{power,y,ex\,post})] \quad (4\text{-}21)$$

Where:

$ER_{CH4,y,ex\,post}$	Emission reductions achieved from methane recovery based on monitored values for year y (tCO_2e)
$BE_{CH4,y,ex\,post}$	Baseline emissions calculated using equation 1 of AMS-III.D (for projects using option in paragraph 9 (a)) using *ex post* monitored values of $N_{LT,y}$
$PE_{CH4,y,ex\,post}$	Project emissions calculated using equation 5 of AMS-III.D using *ex-post* monitored values of $N_{LT,y}$, $MS\%_{i,y}$, $MS\%_{l}$, AI_l, $Q_{res\,waste,y}$ 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 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:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \quad (4\text{-}22)$$

Where:

$BG_{burnt,y}$	The amount of biogas utilized in year y (m^3)
$w_{CH4,y}$	Methane content in biogas in the year y (volume fraction)
FE	Flare efficiency of biogas utilized for energy generation in year (fraction, 100% is applied, determined by paragraph 22 of AMS-III.D)

In conclusion, emission reductions from energy generation are summarized as below:

$$ER_{y,ex\ post} = ER_{CH4,\ y,ex\ post} + BE_{Ele,\ y} \quad (4\text{-}23)$$

Where:

$ER_{y,ex\ post}$	Emission Reductions based on monitored values for year *y* (tCO_2e)
$ER_{CH4,\ y,ex\ post}$	Emission reductions achieved from methane recovery based on monitored values for year *y* (tCO_2e)
$BE_{Ele,\ y}$	Baseline emissions from electricity generation in year y (tCO_2e)

B.6.2. Data and parameters that are to be reported ex-ante
(Copy this table for each data and parameter.)

Data / Parameter	MCF_j
Unit	%
Description	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data	IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	For the MCF value, country-specific MCF values are not available, so he IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 was used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$B_{O,LT}$
Unit	$m^3/CH_4/kg$ dm
Description	Maximum methane producing potential of the volatile solid generated for animal type "LT"
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	According to AMS-III.D, The maximum methane-producing capacity of the manure (Bo) varies by species and diet. Since country specific Bo 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. In the project case, Bo IPCC default values applicable to Asia would be used in all CPAs under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.

Data / Parameter	$MS\%_{Bl,j}$
Unit	%
Description	Fraction of manure handled in baseline animal manure management system "j"
Source of data	FSR
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	All manure handled in baseline animal manure management.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$W_{default}$
Unit	kg
Description	Default average animal weight of a defined population
Source of data	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$VS_{default}$
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	Default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10.
Value(s) applied	Please see individual CPA-DD
Choice of data or Measurement methods and procedures	IPCC default value is credible data source.IPCC default value is credible data source. In the project case, IPCC default values applicable to Asia would be used in the CPA under the PoA. As per IPCC, the values of Asia are based on the estimates for China. Therefore, it is suitable for the CPA to adopt the IPCC default values of Asia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	MCF_l
Unit	-
Description	Annual methane conversion factor for the project manure storage device *l*
Source of data	Table 10.17, Chapter 10, Volume 4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See individual CPA-DD
Choice of data or Measurement methods and procedures	According to the Methodology AMS III.D., IPCC default value should be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$fv_{CH4,RG,h}$
Unit	-
Description	Volumetric fraction of methane in the residual gas on dry basis in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	60%
Choice of data or Measurement methods and procedures	A default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$w_{CH4,y}$
Unit	-
Description	Methane content in biogas in the year *y*
Source of data	AMS-III.D.
Value(s) applied	60%
Choice of data or Measurement methods and procedures	According to AMS-III.D., a default value of 60% methane content can be used.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	η_{flare}
Unit	-
Description	Flare efficiency in hour h
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0
Choice of data or Measurement methods and procedures	0 is used for this parameter. This is conservative.
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the flaring is involved

Data / Parameter	EF_{CO2}
Unit	tCO_2/km
Description	CO_2 emission factor from fuel use due to transportation
Source of data	Since there is no such parameter in IPCC 2006 Guidelines, thus the value in IPCC 1996 is applied
Value(s) applied	0.001011
Choice of data or Measurement methods and procedures	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75
Purpose of data	Calculation of project emissions
Additional comment	Only applied for the CPAs in which the material transportation is involved

Data / Parameter	$\rho_{CH4,n}$
Unit	kg/m^3
Description	Density of methane at normal conditions
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	Tool to determine project emissions from flaring gases containing methane
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to the grid by power plant / unit m in year y

Source of data	*China Electric Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$FC_{i,y}$
Unit	mass or volume unit
Description	Amount of fossil fuel type i consumed in the project electricity system in year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$F_{i,j,y}$
Unit	Mass or volume
Description	The fuel consumption of fuel i in power plant j during year y
Source of data	*China Energy Statistical Yearbook, 2008-2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$NCV_{i,y}$
Unit	TJ/t, TJ/km^3
Description	Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*
Source of data	*China Energy Statistical Yearbook, 2010*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.

Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use accurate and reliable local or national data where available.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ (tCO_2e/TJ)
Description	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$OXID_{i,y}$
Unit	%
Description	Oxidation factor of the fuel *i* in year *y*
Source of data	*IPCC 2006 Revised Guidelines*
Value(s) applied	Values depend on specifically fuel, referring to Appendix 4.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system* requirement, use IPCC default value.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	**Internal use rate of power plant**
Unit	%
Description	The internal power consumption of power plants in year(s) *y*
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of project emissions

Additional comment	Reasonable

Data / Parameter	$CAP_{i, j, y}$
Unit	MW
Description	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Coal, Adv}$
Unit	%
Description	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	39.65%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Oil, Adv}$
Unit	%
Description	The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	$EF_{Gas, Adv}$
Unit	%

Description	The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.93%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Calculation of project emissions
Additional comment	Reasonable

Data / Parameter	**$EF_{grid,CM,y}$**
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the .Tool to calculate the emission factor for an electricity system.
Source of data	As per the "Tool to calculate the emission factor for an electricity system."
Value(s) applied	Official data
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system."
Purpose of data	Calculation of project emissions
Additional comment	Office data

Project Location	Power gird	$EF_{grid,CM,y}$
Anhui and Jiangsu Province	East China Power Grid (ECPG)	0.74945 tCO_2/MWh
Yunnan Province	Southern China Power Grid (SCPG)	0.6323 tCO_2/MWh

B.6.3. Ex-ante calculations of emission reductions

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The ex-ante emission reduction calculations will be done in each specific CPA-DD on the basis of the equations in section B.6.1. above and the option chosen as per the EF tool during the process of inclusion of a CPA in the PoA.

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA
(Copy this table for each data and parameter)

Data / Parameter	W_{site}
Unit	kg
Description	Average animal weight of a defined livestock population at the CPA site
Source of data	Farm Owners
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Farm owners will measure weight of livestock alive with mass scale and calculate the average in a project year.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	nd_y
Unit	day
Description	Number of days in year "y" where the animal manure management system is operational.
Source of data	Assumed 365 days in the CPA, actual data is from the measurement.
Value(s) applied	365
Measurement methods and procedures	The data is obtained from the operation records of the animal manure management system,system as the sum of operation hours.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{da,y}$
Unit	Number
Description	Number of days animal is alive in the farm in the year y
Source of data	The data used in the CPA is come from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$N_{p,y}$
Unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	The data used in the CPA comes from the farm owners, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The data should be recorded in the management log periodically.
Monitoring frequency	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_{i,y}$
Unit	%
Description	Fraction of manure handled in system *i* in year *y*
Source of data	The farm owners, all manure handled in CPA animal manure management.
Value(s) applied	The data used in the CPA is come from the farm owners, the actual data should be monitored annually based on monthly records.
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$MS\%_l$
Unit	-
Description	Fraction of volatile solids (%) handled by storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Monitored annually. Archive electronically during project plus 2 years.
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	AI_l
Unit	days
Description	Annual average interval between manure collection and delivery for treatment at a given storage device *l*
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-treated in the year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$Q_{y,treatment}$
Unit	tonnes
Description	Quantity of compost produced in year
Source of data	Project owner, the actual data should be monitored annually based on daily measurement and monthly aggregation
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On-site data sheets recorded monthly using weigh bridge. Annually, based on daily measurement and monthly aggregation.
Monitoring frequency	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$CT_{y,treatment}$
Unit	tonnes/truck
Description	Average truck capacity for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	On site measurement. Annually, based on monthly records
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$DAF_{treatment}$
Unit	km/truck
Description	Average distance for compost transportation
Source of data	Project owner, the actual data should be monitored annually based on monthly records.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Annually on site measurement
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter	$B_{biomass-3,PJ,y}$
Unit	m^3
Description	The net quantity of the biogas supplied to power generator in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by one flow meter installed at the inlet of the generator.
Monitoring frequency	
QA/QC procedures	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions

Additional comments	

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	The amount of biogas utilized in year *y*
Source of data	Onsite measurement
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Measured continuously by flow meter.
Monitoring frequency	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
QA/QC procedures	-
Purpose of data	m^3
Additional comments	The amount of biogas utilized in year *y*

Data / Parameter	$FV_{RG,h}$
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
Source of data	Onsite measurement by flow meter
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Biogas sent to the flare will be monitored through the use of biogas flow meter continuously and reported cumulatively on weekly basis.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter will only be monitored when there is surplus gas from the Project and a flare is installed. The flow meter will undergo maintenance/calibration annually subject to appropriate industry standards by qualified entity.

Data / Parameter	P_{PJ}
Unit	Pa
Description	Pressure of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The pressure of the biogas will be recorded daily using manometer and monthly averaged.
Monitoring frequency	–

QA/QC procedures	The manometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	T_{PJ}
Unit	ºC
Description	Temperature of the biogas at the flow measurement site
Source of data	Onsite measurement
Value(s) applied	N/A
Measurement methods and procedures	The temperature of the biogas will be recorded daily using thermometer and monthly averaged.
Monitoring frequency	-
QA/QC procedures	Thermometer will undergo maintenance/calibration subject to appropriate industry standards.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{Ele,y}$
Unit	MWh/year
Description	Quantity of net electricity generated by the CPA in year *y*
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Electricity meters should be installed to measure the quantity of the electricity generated by the CPA in year y.
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EC_{ele,PJ,ye}$
Unit	MWh/year
Description	Quantity of net electricity consumed by the CPA in year *y*
Source of data	The data used come from FSR, the actual data should be measured with electricity meter.
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	Electricity meters should be installed to measure the quantity of the electricity consumed by the CPA in year y.
Monitoring frequency	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers. At the same time the invoice should be used for verification.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Soil application of the residue waste
Unit	-
Description	Soil application (not resulting in methane emissions) of the residual waste.
Source of data	The actual information should be assessed through onsite check
Value(s) applied	Please see individual CPA-DD
Measurement methods and procedures	The soil application when the final sludge used will be monitored and recorded by the project owner.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA

>>

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 project owner is responsible for the implementation of the monitoring plan, and the consumers cooperate with the project owner.

1.Monitoring Parameters

Data/parameters needed to be monitored are listed below in the table:

No.	Data/Parameter	Description	Source of data	Record Frequency
1	W_{site}	Average animal weight of a defined livestock population at the CPA site	Farm Owners	-
2	nd_y	Number of days in year "y" where the animal manure management system is operational.	Farm Owners	-
3	$N_{da,y}$	Number of days animal is alive in the farm in the year y	Farm Owners	monthly
4	$N_{p,y}$	Number of animals produced annually of type LT for the year y	Farm Owners	monthly
5	$MS\%_{i,y}$	Fraction of manure handled in system *i* in year *y*	Farm Owners	monthly
6	$MS\%_{l}$	Fraction of volatile solids (%) handled by storage device *l*	Farm Owners	monthly
7	AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device *l*	Farm Owners	monthly
8	Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year	Farm Owners	daily
9	$Q_{y,treatment}$	Quantity of compost produced in year	Farm Owners	daily
10	CT_y	Average truck capacity for transportation	Farm Owners	monthly
11	$CT_{y,treatment}$	Average truck capacity for compost transportation	Farm Owners	monthly
12	DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation	Farm Owners	monthly
13	$DAF_{treatment}$	Average distance for compost transportation	Farm Owners	monthly
14	$B_{biomass-3,PJ,y}$	The net quantity of the biogas supplied to power generator in year *y*	Flow meter	Continuously
15	$BG_{burnt,y}$	Biogas combusted in year "y"	Flow meter	Continuously
16	$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	Flow meter	Continuously
17	P_{PJ}	Pressure of the biogas at the flow measurement site	manometer	daily
18	T_{PJ}	Temperature of the biogas at the flow measurement site	Thermometer	daily
19	$EG_{Ele,y}$	Quantity of net electricity generated by the CPA in year *y*	Electricity meter.	Continuously
20	$EC_{ele,PJ,y}$	Quantity of net electricity consumed by the CPA in year *y*	Electricity meter.	Continuously
21	Soil application of the residue waste	Soil application (not resulting in methane emissions) of the residual waste.	Farm Owners	-

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

The coordinating/managing entity opts for a verification method that does not use sampling. Each CPA will be monitored and verified.

2.Monitoring organization

In order to implement the monitoring plan effectively, the specific person in charge of the Programme is designated by CME to make sure the implementation of monitoring plan and keep in touch with EB, DNA and other relevant parties. The monitoring structure is clearly shown in the following figure.

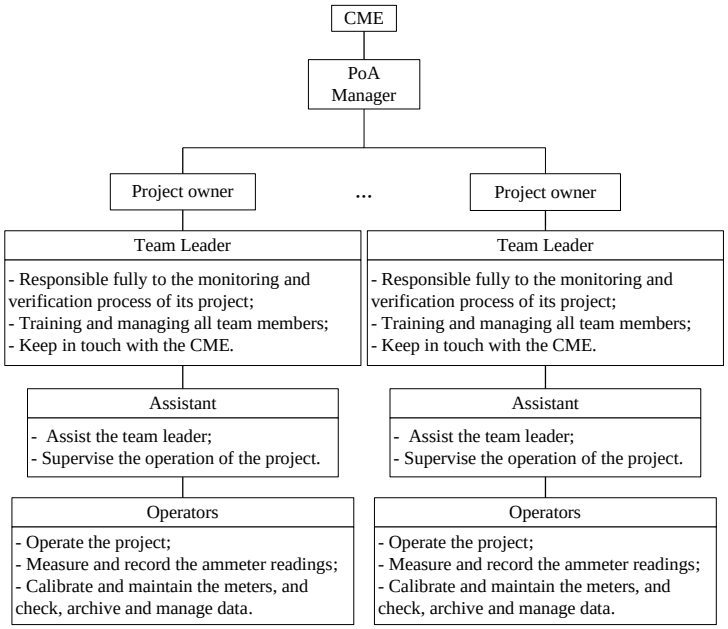

Figure 15.Monitoring team organization

Position	Responsibility description
PoA manager	PoA manager is designated by CME and is in full charge of monitoring and issues related to PoA, in particular: (1) Track the development of POA; keep communication with EB, DNA and related agencies; (2) Establish the monitoring plan and training plan. (3)Collect the data, and supervise implementation of the PoA.
Project Owner	Take in charge of operation and management of project activity, as well as assist PoA manager to conduct monitoring plan according to *Management and Monitoring Manual*.
Monitoring team	Designated by the project owner, and takeTake in charge of monitoring implementation and the data collection according to the *Management and Monitoring Manual*.

All data will be bottom-up collected and reported as shown in monitoring structure and finally reported to CME.

This monitoring plan will be carried out by each monitoring team of each livestock farm under the supervision of the CME, designated by the livestock farm owner, 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 such as receipts of biogas sales.

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.

3.Installation of monitoring equipments

Flow metering systems will be installed in the location 6 and 7 respectively to monitor the biogas supplied to power generation system, and if available, the flaring system; and, electricity metering system will be installed in the location 6 to monitor the generated electricity delivered to Power Grid; if available, electricity metering system will be installed in the location 5 to monitor the electricity from power grid consumed by the project activity (ies).

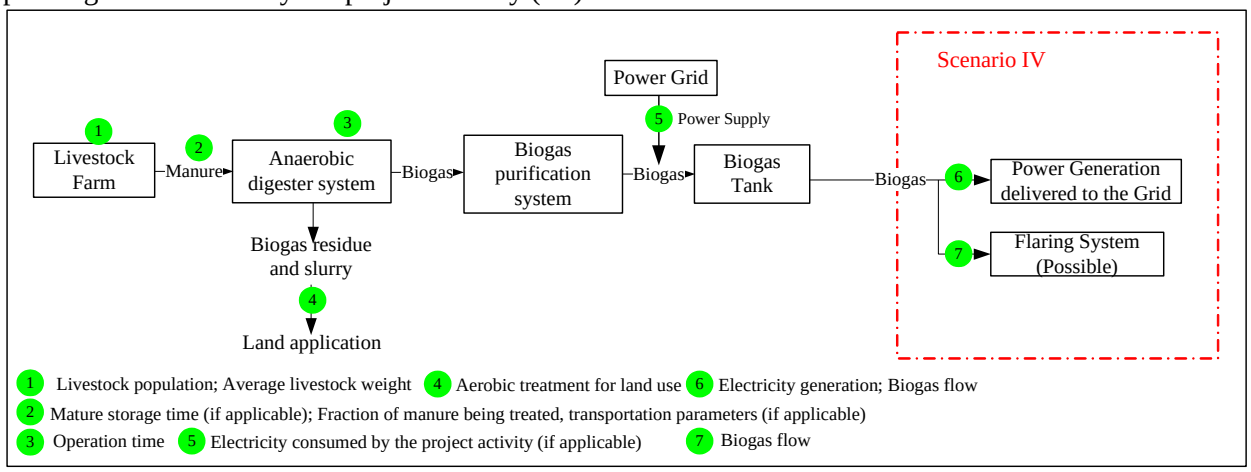

Figure 16.Monitoring system for project scenario

4.Data Collection and Management

All data continuously measured are transmitted to the CME (Each activity owner will take responsibility for data collection). The regular summary should be made and reported to technology department by statistician periodically; all the data after internal validation should be saved up to 2 years after the end of the crediting period.

5.QA/QC

Equipments 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. Once measuring equipment is in fault, it shall be replaced immediately with another calibrated measuring equipment by a professional engineer. During the period of erroneous measurement and replacement of the fault meter, a conservative method that can cause a lower CER value will be used.

If the error of data is caused by accidents during the crediting period, the project owner(s) 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.

6.Training

Before the formal operation of each activity, the person in charge of the CPA will organize the relevant personals to participate the CDM training.

7.Verification

The verification of emission reduction is carried out based on CME's requirements. The CME should provide DOE documents and evidence related to monitoring.

Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	Beijing Huayu Xinda Consultation Co., Ltd.
Street/P.O. Box	16# Zhufanglu, Haidian District, Beijing
Building	Room 362, Building No.1,
City	Beijing
State/Region	Beijing
Postcode	100085
Country	People's Republic of China
Telephone	+86 (10)-5895 1352
Fax	+86 (10)-5804 3640
E-mail	ysy92@163.com
Website	-
Contact person	Jun Yu
Title	Director
Salutation	Mr
Last name	Yu
Middle name	-
First name	Jun
Department	-
Mobile	+86-18611847378
Direct fax	+86 (10)-5804 3640
Direct tel.	+86 (10)-5895 1352
Personal e-mail	ysy92@163.com

Organization	National Development Reform Commission of China
Street/P.O. Box	No.38 South Yuetan Street, Xicheng District
Building	South Building
City	Beijing
State/Region	Beijing
Postcode	100045
Country	China
Telephone	+86(10)-6850 2963
Fax	+86(10)-6850 2358
E-mail	suncuihua@ccchina.gov.cn
Website	-
Contact person	Cuihua Sun
Title	Director
Salutation	Ms.
Last name	Sun
Middle name	-
First name	Cuihua
Department	Climate change
Mobile	-
Direct fax	+86(10)-6850 2358
Direct tel.	+86(10)-6850 2963
Personal e-mail	suncuihua@ccchina.gov.cn

Appendix 2: Affirmation regarding public funding

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

Appendix 3: Application of methodology(ies)

See the applicable sections above.

Appendix 4: Further background information on ex ante calculation of emission reductions

1.BASELINE INFORMATION-- South China Power Grid (SCPG)

The project refers to the *2011 Baseline Emission Factors for Regional Power Grids in China* that is published by the National Development and Reform Committee of China (Chinese DNA) on 20/10/2011 for the OM and BM emission factors of the **South China Power Grid** (**SCPG**). In the reference, emission factors of ECPG are calculated based on the approved *"Tool to calculate the emission factor for an electricity system"*. The $EF_{grid,CM,y}$, $EF_{grid,OM,y}$, and $EF_{grid,BM,y}$ of ECPG could be calculated as following:

Table A1. Fuel-fired power generation of the South China Power Grid in 2007

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	215,700,000	6.01	202,736,430
Guangxi	36,100,000	7.42	33,421,380
Guizhou	84,300,000	6.62	78,719,340
Yunnan	47,400,000	7.23	43,972,980
Total			358,850,130

Data source: China Electric Power Yearbook 2008.

Table A2. Fuel-fired power generation of the South China Power Grid in 2008

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	210,700,000	6.2	197,678,740
Guangxi	34,200,000	7.14	31,758,120
Guizhou	81,300,000	7.04	75,576,480
Yunnan	41,800,000	7.29	38,752,780
Total			343,766,120

Data source: China Electric Power Yearbook 2009.

Table A3. Fuel-fired power generation of the South China Power Grid in 2009

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	214,300,000	6.2	201,099,120
Guangxi	42,800,000	6.69	39,936,680
Guizhou	97,800,000	6.68	91,266,960
Yunnan	54,800,000	6.52	51,227,040
Hainan	11,400,000	8.17	10,468,620
Total			393,998,420

Data source: China Electric Power Yearbook 2010

Table A4. Calculation of simple OM emission factor of the South China Power Grid in 2007

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission Factor (tC/TJ) F	Oxidation Rate (%) G	Emission Factor ($kgCO_2/TJ$) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J[25]
Coal	10^4t	8214.78	1750.63	4298.8	3170.79	**17435**	25.8	100	87,300	20,908	318,235,546
Cleaned coal	10^4t	3.46				**3.46**	25.8	100	87,300	26,344	79,574
Other washed coal	10^4t		0.65	21.58	14.64	**36.87**	25.8	100	87,300	8,363	269,184
Briquette	10^4t	271.25				**271.25**	26.6	100	87,300	20,908	4,951,041
Coke	10^4t	0.04	1.69		2.15	**3.88**	29.2	100	95,700	28,435	105,584
Coke oven gas	10^8m^3		0.96	3.19	1.8	**5.95**	12.1	100	37,300	16,726	371,208
Other gas	10^8m^3		30.77		21.63	**52.4**	12.1	100	37,300	5,227	1,021,628
Crude oil	10^4t					**0**	20	100	71,100	41,816	0
Gasoline	10^4t					**0**	18.9	100	67,500	43,070	0
Diesel	10^4t	21.37	2.13		2.29	**25.79**	20.2	100	72,600	42,652	798,596
Fuel oil	10^4t	467.97	0.41			**468.38**	21.1	100	75,500	41,816	14,787,262
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.37				**0.37**	15.7	100	48,200	46,055	8,213
Nature gas	10^8m^3	32.17				**32.17**	15.3	100	54,300	38,931	6,800,588
Other Petroleum Products	10^4t	8.47				**8.47**	20	100	72,200	41,816	255,719
Other Coking Products	10^4t					**0**	25.8	100	95,700	28,435	0
Other energy	10^4tCe	118.04	81.89	44.1	50.3	**294.33**	0	0	0	0	0
Total emission of the South China Power Grid (tCO_2e) J						347,684,143					
Fossil power supply of the South China Power Grid (MWh) M						358,850,130					
Imported electricity from the Central China Power Grid (MWh) N						24,237,240					
Emission factor of Central China Power Grid(tCO2e/MWh) O						1.10197					
Total emission (tCO2e) P=J+O*N						**374,392,940**					
Total electricity delivered to the grid (MWh) Q= M+N						**383,087,370**					

Data sources: China Energy Statistical Yearbook 2008

[25] J=E*H*I/100000 (mass unit) or J= E*H*I/10000 (volume unit)

Table A5. Calculation of simple OM emission factor of the South China Power Grid in 2008

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	Emission factor ($kgCO_2/TJ$) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Coal	10^4t	8001.54	1513.1	4117.45	2766.85	**16398.94**	25.8	100	87,300	20,908	299,324,670
Cleaned coal	10^4t	2.31				**2.31**	25.8	100	87,300	26,344	53,126
Other washed coal	10^4t		0.08	13.38	57.11	**70.57**	25.8	100	87,300	8,363	515,224
Briquette	10^4t	297.43				**297.43**	26.6	100	87,300	20,908	5,428,896
Coke	10^4t	3.24	1.73		2.74	**7.71**	29.2	100	95,700	28,435	209,807
Coke oven gas	10^8m^3		1.55	3.92	2.17	**7.64**	12.1	100	37,300	16,726	476,644
Other gas	10^8m^3	1.09	29.6		35.71	**66.4**	12.1	100	37,300	5,227	1,294,582
Crude oil	10^4t					**0**	20	100	71,100	41,816	0
Gasoline	10^4t	0.01				**0.01**	18.9	100	67,500	43,070	291
Diesel	10^4t	10.46	0.97		2.28	**13.71**	20.2	100	72,600	42,652	424,535
Fuel oil	10^4t	344.59	0.24			**344.83**	21.1	100	75,500	41,816	10,886,656
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.76				**0.76**	15.7	100	48,200	46,055	16,871
Nature gas	10^8m^3	35.6				**35.6**	15.3	100	54,300	38,931	7,525,674
Other Petroleum Products	10^4t	7.3				**7.3**	20	100	72,200	41,816	220,395
Other Coking Products	10^4t					**0**	25.8	100	95,700	28,435	0
Other energy	10^4tCe	120.17	103.26	89.44	42.63	**355.5**	0	0	0	0	0
Total emission of the South China Power Grid (tCO_2e) J						326,377,370					
Fossil power supply of the South China Power Grid (MWh) M						343,766,120					
Imported electricity from the Central China Power Grid (MWh) N						22,342,090					
Emission factor of Central China Power Grid(tCO2e/MWh) O						1.04205					

Total emission (tCO2e) P=J+O*N	**349,658,904**
Total electricity delivered to the grid (MWh) Q= M+N	**366,108,210**

Data sources: China Energy Statistical Yearbook 2009

Table A6. Calculation of simple OM emission factor of the South China Power Grid in 2009

Energy	**Unit**	**Guangdong A**	**Guangxi B**	**Guizhou C**	**Yunnan D**	**Hainan K**	**Total Fuel E=A+B+C+D+K**	**Emission Factor (tC/TJ) F**	**Oxidation Rate (%) G**	**Emission Factor ($kgCO_2/TJ$) H**	**NCV (MJ/t or $1000m^3$) I**	**Emission (tCO_2e) J**
Coal	10^4t	8011.98	1815.41	4925.23	3311.44	376.59	**18440.65**	25.8	100	87,300	20,908	336,591,357
Cleaned coal	10^4t	1.8					**1.8**	25.8	100	87,300	26,344	41,397
Other washed coal	10^4t			11.67	44.92		**56.59**	25.8	100	87,300	8,363	413,158
Briquette	10^4t	195.86					**195.86**	26.6	100	87,300	20,908	3,574,971
Coke	10^4t	4.9	1.6		1.63		**8.13**	29.2	100	95,700	28,435	221,236
Coke oven gas	10^8m^3		2.89	2.02	2.48		**7.39**	12.1	100	37,300	16,726	461,047
Other gas	10^8m^3	1.11	20.88		48.61		**70.6**	12.1	100	37,300	5,227	1,376,468
Crude oil	10^4t						**0**	20	100	71,100	41,816	0
Gasoline	10^4t						**0**	18.9	100	67,500	43,070	0
Diesel	10^4t	6.46	0.52		0.49	0.12	**7.59**	20.2	100	72,600	42,652	235,027
Fuel oil	10^4t	157.37	0.09				**157.46**	21.1	100	75,500	41,816	4,971,182
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.51					**0.51**	15.7	100	48,200	46,055	11,321
Nature gas	10^8m^3	47.21				6.19	**53.4**	15.3	100	54,300	38,931	11,288,511
Other Petroleum Products	10^4t	45.31				0.83	**46.14**	20	100	72,200	41,816	1,393,020
Other Coking Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other	10^4tC	152.99	98.56	23.01	49.01	20	**343.57**	0	0	0	0	0

energy	e											
Total emission of the South China Power Grid (tCO_2e) J							360,578,694					
Fossil power supply of the South China Power Grid (MWh) M							393,998,420					
Imported electricity from the Central China Power Grid (MWh) N							21,852,270					
Emission factor of Central China Power Grid(tCO_2e/MWh) O							0.95455					
Total emission (tCO2e) P=J+O*N							**381,437,884**					
Total electricity delivered to the grid (MWh) Q= M+N							**415,850,690**					

Data sources: China Energy Statistical Yearbook 2010

$EF_{OM,y}=(P_{2007}+P_{2008} +P_{2009}) / (Q_{2007}+Q_{2008} +Q_{2009}) =$ 0.9489 tCO_2e/MWh

Table A7. Data and result of Step (1) for simple BM emission factor

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Subtotal	NCV (MJ/t or 1000m^3)	Emission factor (tC/TJ)	Oxidation Rate	CO_2 Emission（tCO_2e）
		A	**B**	**C**	**D**	**E**	**G=A+…+E**	**H**	**I**	**J**	**K=G*H*I*J/100000**
Raw Coal	10^4 t	8,011.98	1,815.41	4,925.23	3,311.44	376.59	18,440.65	20,908	87,300	1.00	336,591,357
Cleaned Coal	10^4 t	1.80	0.00	0.00	0.00	0.00	1.80	26,344	87,300	1.00	41,397
Other Washed Coal	10^4 t	0.00	0.00	11.67	44.92	0.00	56.59	8,363	87,300	1.00	413,158
Briquettes	10^4 t	195.86	0.00	0.00	0.00	0.00	195.86	20,908	87,300	1.00	3,574,971
Coke	10^4 t	4.90	1.60	0.00	1.63	0.00	8.13	28,435	95,700	1.00	221,236
Other Coking Products	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	28,435	95,700	1.00	0
Subtotal							0.00				**340,842,119**
Crude Oil	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	41,816	71,100	1.00	0
Gasoline	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	43,070	67,500	1.00	0
Diesel Oil	10^4 t	6.46	0.52	0.00	0.49	0.12	7.59	42,652	72,600	1.00	235,027
Fuel Oil	10^4 t	157.37	0.09	0.00	0.00	0.00	157.46	41,816	75,500	1.00	4,971,182
Other Petroleum Products	10^4 t	45.31	0.00	0.00	0.00	0.83	46.14	41,816	72,200	1.00	1,393,020
Subtotal							0.00				**6,599,229**
Natural Gas	$10^7 m_3$	472.10	0.00	0.00	0.00	61.90	534.00	38,931	54,300	1.00	11,288,511
Coke Oven Gas	$10^7 m_3$	0.00	28.90	20.20	24.80	0.00	73.90	16,726	37,300	1.00	461,047
Other Gas	$10^7 m_3$	11.10	208.80	0.00	486.10	0.00	706.00	5,227	37,300	1.00	1,376,468
LPG	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	50,179	61,600	1.00	0
Refinery Gas	10^4 t	0.51	0.00	0.00	0.00	0.00	0.51	46,055	48,200	1.00	11,321
Subtotal											**13,137,347**
Total											**360,578,695**

Data sources: China Energy Statistical Yearbook 2010.

Calculate with data provided in Table A7 and formula (4)~(6), the value for $\lambda_{Coal,y}$ =94.53%，$\lambda_{Oil,y}$ =1.83%，$\lambda_{Gas,y}$ =3.64%

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel ($kgCO_2/TJ$)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1,000,000*B*C
Coal-based power plants	$EF_{Coal,Adv}$	39.45%	87,300	1	0.7967
Gas-based power plants	$EF_{Gas,Adv}$	51.77%	75,500	1	0.5250
Oil-based power plants	$EF_{Oil,Adv}$	51.77%	54,300	1	0.3776

$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ =0.7765tCO$_2$e/MWh

Table A9. Installed capacity of the South China Power Grid in 2009

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Total
Thermal power (MW)	48,300	10,770	10,710	17,310	3,090	90,180
Hydro power (MW)	11,260	14,750	20,900	13,610	700	61,220
Nuclear power (MW)	3,950	0	0	0	0	3,950
Wind power and Other (MW)	560	0	80	0	60	700
Total (MW)	64,070	25,520	31,690	30,920	3,850	156,050

Data source: China Electric Power Yearbook 2010

Table A10. Installed capacity of the South China Power Grid in 2008

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Total
Thermal power (MW)	45,730	10,270	10,030	17,170	2,370	85,570
Hydro power (MW)	10,280	13,970	15,740	9,470	410	49,870
Nuclear power (MW)	3,780	0	0	0	0	3,780
Wind power and Other (MW)	290	0	80	0	10	380
Total (MW)	60,080	24,240	25,850	26,640	2,790	139,600

Data source: China Electric Power Yearbook 2009

Table A11. Installed capacity of the South China Power Grid in 2007

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Total
Thermal power (MW)	44,710	9,310	10,630	15,960	2,400	83,010
Hydro power (MW)	10,110	10,440	11,580	8,210	590	40,930
Nuclear power (MW)	3,780	0	0	0	0	3,780
Wind power and Other (MW)	250	0	0	0	24	274
Total (MW)	58,850	19,750	22,210	24,170	3,014	127,994

Data source: China Electric Power Yearbook 2008

Table A12. Calculation of BM emission factor of the South China Power Grid

	Installed capacity in 2007 (MW) A	Installed capacity in 2008 (MW) B	Installed capacity in 2009 (MW) C	Capacity additions from 2007 to 2009[1] (MW) D	Capacity additions from 2008 to 2009[2] (MW) E	Share in total capacity additions
Thermal power	83,010	85,570	90,180	14,447	8,705.6	40.66%
Hydro power	40,930	49,870	61,220	20,488	11,350	57.66%
Nuclear power	3,780	3,780	3,950	170	170	0.48%
Wind power and other	274	380	700	426	320	1.20%
Total	**127,994**	**139,600**	**156,050**	**35,530.8**	**20,545.6**	**100.00%**
Share in total installed capacity of 2009				22.77%	13.17%	

Note: 1 and 2 are the results of new additions with considering installed capacities, shutdown capacities and installed capacities of pumped storage.

$EF_{BM,y}$ =0.7764 × 40.66% = 0.3157 tCO_2/MWh

Then, the result is:

$\boldsymbol{EF_{grid,CM,y}}$= 0.5×$EF_{grid,OM,y}$+ 0. 5×$EF_{grid,BM,y}$=0.5 × 0.9489+ 0.5 × 0.3157

= **0.6323 (tCO_2e/MWh)**

2.BASELINE INFORMATION-- East China Power Grid (ECPG)

The project refers to the *2011 Baseline Emission Factors for Regional Power Grids in China* that is published by the National Development and Reform Committee of China (Chinese DNA) on 20/10/2011 for the OM and BM emission factors of the **East China Power Grid (ECPG)**. In the reference, emission factors of ECPG are calculated based on the approved *"Tool to calculate the emission factor for an electricity system"*. The $EF_{grid,CM,y}$, $EF_{grid,OM,y}$, and $EF_{grid,BM,y}$ of ECPG could be calculated as following:

Table 1 Electricity Generation of ECPG in 2007

Province	**Electricity generation （MWh)**	**Self usage rate （%）**	**Electricity delivered to the grid （MWh)**
Shanghai	72,600,000	4.72	69,173,280
Jiangsu	270,900,000	5.55	255,865,050
Zhejiang	172,300,000	5.83	162,254,910
Anhui	84,800,000	5.92	79,779,840
Fujian	72,300,000	5.59	68,258,430
Total			**635,331,510**

Sources: China Electric Power Yearbook 2008

Table 2 Electricity Generation of ECPG in 2008

Province	**Electricity generation （MWh)**	**Self usage rate （%）**	**Electricity delivered to the grid （MWh)**
Shanghai	79,400,000	4.88	75,525,280
Jiangsu	273,500,000	5.51	258,430,150
Zhejiang	174,800,000	5.77	164,714,040
Anhui	107,400,000	5.72	101,256,720
Fujian	74,800,000	5.61	70,603,720
Total			**670,529,910**

Sources: China Electric Power Yearbook 2009

Table 3 Electricity Generation of ECPG in 2009

Province	**Electricity generation （MWh)**	**Self usage rate （%）**	**Electricity delivered to the grid （MWh)**
Shanghai	78,200,000	5.22	74,117,960
Jiangsu	282,500,000	5.38	267,301,500
Zhejiang	185,500,000	5.66	175,000,700
Anhui	129,900,000	5.59	122,638,590
Fujian	88,600,000	5.1	84,081,400
Total	764,700,000		**723,140,150**

Sources: China Electric Power Yearbook 2010

Table 4 Calculating CO_2 Emission of ECPG in 2007

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions (tCO_2e)
								($kgCO_2/TJ$)	($MJ/t,km^3$)	I=G*H*F*/100000 (mass unit) I=G*H*F*/100000 (volume unit)
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	
Raw Coal	10^4t	2754.04	11060.78	7350	3929.9	3097.87	**28192.59**	87,300	20,908	514,590,436
Cleaned coal	10^4t						**0**	87,300	26,344	0
Other Washed Coal	10^4t		459.17		29.32		**488.49**	87,300	8,363	3,566,416
Briquettes	10^4t						**0**	87,300	20,908	0
Coke	10^4t			35.06			**35.06**	95,700	28,435	954,063
Coke Oven Gas	10^8m^3	0.89	9.73	0.22	1.56	0.75	**13.15**	37,300	16,726	820,402
Other Gas	10^8m^3	98.92	70.45	3.41	36.3	1.71	**210.79**	37,300	5,227	4,109,712
Crude Oil	10^4t			15.15			**15.15**	71,100	41,816	450,427
Gasoline	10^4t						**0**	67,500	43,070	0
Diesel Oil	10^4t	1.23	5.37	2.76		1.01	**10.37**	72,600	42,652	321,111
Fuel Oil	10^4t	40.76	1.55	29.52		2.04	**73.87**	75,500	41,816	2,332,156
LPG	10^4t						**0**	61,600	50,179	0
Refinery Gas	10^4t	0.2	0.63		2.55		**3.38**	48,200	46,055	75,031
Natural Gas	10^8m^3	4.61	19.17	11.01			**34.79**	54,300	38,931	7,354,444
Other Petroleum Products	10^4t	20.39	2.78				**23.17**	72,200	41,816	699,529
Other Coking Products	10^4t						**0**	95,700	28,435	0
Other Energy	10^4tce	6.89	28.88	44.93	7.52	9.43	**97.65**	0	0	0
									total	535,273,726
Net electricity import from Shanxi Yangcheng City (MWh)										12,773,620
Average emission factor of Shanxi Yangcheng City (tCO_2e/MWh)										0.97254
Net electricity import from Central China Grid (MWh)										31,823,310
Average emission factor of Central China (tCO_2e/MWh)										1.10197
Total emission of ECPG (tCO_2)										582,765,035
Total power supplied to ECPG (MWh)										679,928,440
Simple OM emission factor of ECPG (tCO_2e/MWh)										**0.85710**

Sources: China Energy Statistical Yearbook 2008

Table 5 Calculating CO_2 Emission of ECPG in 2008

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions (tCO_2e)
								($kgCO_2/TJ$)	($MJ/t,km^3$)	I=G*H*F*/100000 (mass unit) I=G*H*F*/100000 (volume unit)
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	
Raw Coal	10^4t	2964.04	10890.2	7316.17	4887.18	3264.88	**29322.47**	87,300	20,908	535,213,779
Cleaned coal	10^4t						**0**	87,300	26,344	0
Other Washed Coal	10^4t		513.34		33.49		**546.83**	87,300	8,363	3,992,351
Briquettes	10^4t						**0**	87,300	20,908	0
Coke	10^4t			31.12			**31.12**	95,700	28,435	846,847
Coke Oven Gas	10^8m^3	0.5	11.65	0.13	5.62	0.31	**18.21**	37,300	16,726	1,136,085
Other Gas	10^8m^3	98.42	77.84	3.57		6.36	**186.19**	37,300	5,227	3,630,092
Crude Oil	10^4t			8.31			**8.31**	71,100	41,816	247,066
Gasoline	10^4t						**0**	67,500	43,070	0
Diesel Oil	10^4t	5.85	4.04	2.05		1.04	**12.98**	72,600	42,652	401,930
Fuel Oil	10^4t	24.43	0.39	13.48		1.81	**40.11**	75,500	41,816	1,266,316
LPG	10^4t						**0**	61,600	50,179	0
Refinery Gas	10^4t	0.05	0.28		1.5	0.57	**2.4**	48,200	46,055	53,276
Natural Gas	10^8m^3	3.65	25.14	8.99		0.19	**37.97**	54,300	38,931	8,026,681
Other Petroleum Products	10^4t	21.33	3.09				**24.42**	72,200	41,816	737,268
Other Coking Products	10^4t						**0**	95,700	28,435	0
Other Energy	10^4tce	15.88	62.57	34.54		8.99	**121.98**	0	0	0
									total	555,551,691
Net electricity import from Shanxi Yangcheng City (MWh)										16,903,640
Average emission factor of Shanxi Yangcheng City (tCO_2e/MWh)										1.004945
Net electricity import from Central China Grid (MWh)										35,684,610
Average emission factor of Central China (tCO_2e/MWh)										1.04205
Total emission of ECPG (tCO_2)										609,724,008
Total power supplied to ECPG (MWh)										723,118,160
Simple OM emission factor of ECPG (tCO_2e/MWh)										**0.84319**

Sources: China Energy Statistical Yearbook 2009

Table 6 Calculating CO_2 Emission of ECPG in 2009

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	EF	NCV	CO_2 emissions
								($kgCO_2/TJ$)	($MJ/t,km^3$)	I=G*H*F*/100000 (mass unit) I=G*H*F*/100000 (volume unit)
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	
Raw Coal	10^4t	2860.29	10875.32	7592.14	5782.21	3539.1	**30649.06**	87,300	20,908	559,427,607
Cleaned coal	10^4t						**0**	87,300	26,344	0
Other Washed Coal	10^4t		324.83		50.83		**375.66**	87,300	8,363	2,742,656
Coke	10^4t			50.46			**50.46**	95,700	28,435	1,373,132
Coke Oven Gas	10^8m^3	1.02	8.96	0.29	5.64	0.47	**16.38**	37,300	16,726	1,021,915
Other Gas	10^8m^3	109.27	101.42	3.67		8.42	**222.78**	37,300	5,227	4,343,477
Crude Oil	10^4t			3.36			**3.36**	71,100	41,816	99,897
Gasoline	10^4t						**0**	67,500	43,070	0
Diesel Oil	10^4t	1.03	1.67	1.49		4.16	**8.35**	72,600	42,652	258,561
Fuel Oil	10^4t	13.13		8.87		0.46	**22.46**	75,500	41,816	709,086
LPG	10^4t						**0**	61,600	50,179	0
Refinery Gas	10^4t	0.06	0.17		1.97	14.15	**16.35**	48,200	46,055	362,946
Natural Gas	10^8m^3	5.37	22.78	8.87	0.23	5.74	**42.99**	54,300	38,931	9,087,885
Other Petroleum Products	10^4t	18.6	5.31				**23.91**	72,200	41,816	721,870
Other Coking Products	10^4t						**0**	95,700	28,435	0
Other Energy	10^4tce	14.84	89.4	43.75	33.62	12.59	**194.2**	0	0	0
									total	580,149,033
Net electricity import from Shanxi Yangcheng City (MWh)										16,626,120
Average emission factor of Shanxi Yangcheng City (tCO_2e/MWh)										0.964179
Net electricity import from Central China Grid (MWh)										36,599,120
Average emission factor of Central China (tCO_2e/MWh)										0.95455
Total emission of ECPG (tCO_2)										631,115,448
Total power supplied to ECPG (MWh)										776,365,390
Simple OM emission factor of ECPG (tCO_2e/MWh)										**0.81291**

Sources: China Energy Statistical Yearbook 2010

Therefore, $EF_{grid,OM,simple}$ **= 0.8367 tCO₂e/MWh**

Step 5. Calculate the build margin emission factor

The Emission Factor, Oxidation, Average Low Caloric Value applied in the calculation of the Operating Margin and Build Margin emission factor are listed in table 8.

Table 7 Related Parameters

Fuel	Oxidation I [1]	Average Low Caloric Value J[2]	Emission Factor($kgCO_2/TJ$)[3]
Raw Coal	100	20,908 KJ/kg	87,300
Cleaned Coal	100	26,344 KJ/kg	87,300
Briquettes	100	20,908 KJ/kg	87,300
Other Washed Coal	100	8,363 KJ/kg	87,300
Coke	100	28,435 KJ/kg	95,700
Crude Oil	100	41,816 KJ/kg	71,100
Gasoline	100	43,070 KJ/kg	67,500
Diesel Oil	100	42,652 KJ/kg	72,600
Fuel Oil	100	41,816 KJ/kg	75,500
Other Petroleum	100	41,816 KJ/kg	75,500
LPG	100	50,179 KJ/kg	61,600
Refinery Gas	100	46,055 KJ/kg	48,200
Natural Gas	100	38,931 MJ/km^3	54,300
Other Petroleum Products	100	41,816 KJ/kg	75,500
Other Coking Products	100	28,435 KJ/kg	95,700

Source: 1,2,3 China Energy Statistical Yearbook 2010，Page 285

Sub-step 1. Calculating the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions.

Table 8 The percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions

Fuel type	***Unit***	*Shanghai*	*Jiangsu*	*Zhejiang*	*Anhui*	*Fujian*	*Total*	*NCV*	*Emission factor*	*CO_2 emissions (tCO_2e)*
								(MJ/t,km^3)	*($kgCO_2/TJ$)*	
		A	*B*	*C*	*D*	*E*	*F=A+…+E*	*G*	*H*	*I=F×G×H/100,000*
Raw coal	*10^4t*	2,860.29	10,875.32	7,592.14	5,782.21	3,539.1	30,649.06	20,908	87,300	559,427,607
Cleaned coal	*10^4t*	0	0	0	0	0	0	26,344	87,300	0
Other washed coal	*10^4t*	0	324.83	0	50.83	0	375.66	8,363	87,300	2,742,656
Briquette		0	0	0	0	0	0	20,908	87,300	0
Coke	*10^4t*	0	0	50.46	0	0	50.46	28,435	95,700	1,373,132
Other coke products	*10^4t*	0	0	0	0	0	0	28,435	95,700	0
Sub-total										563,543,395
Crude oil	*10^4t*	0	0	3.36	0	0	3.36	41,816	71,100	99,897
Gasoline	*10^4t*	0	0	0	0	0	0	43,070	67,500	0
Diesel	*10^4t*	1.03	1.67	1.49	0	4.16	8.35	42,652	72,600	258,561
Fuel oil	*10^4t*	13.13	0	8.87	0	0.46	22.46	41,816	75,500	709,086
Other petroleum products	*10^4t*	18.6	5.31	0	0	0	23.91	41,816	72,200	721,870
Sub-total										1,789,414
Natural gas	*10^7m^3*	53.7	227.8	88.7	2.3	57.4	429.9	38,931	54,300	9,087,885
Coke oven gas	*10^7m^3*	10.2	89.6	2.9	56.4	4.7	163.8	16,726	37,300	1,021,915
Other gas	*10^7m^3*	1,092.7	1,014.2	36.7	0	84.2	2,227.8	5,227	37,300	4,343,477
PLG	*10^4t*	0	0	0	0	0	0	50,179	61,600	0
Refinery gas	*10^4t*	0.06	0.17	0	1.97	14.15	16.35	46,055	48,200	362,946
Sub-total										14,816,223
Total										**580,149,033**

Sources: China Energy Statistical Yearbook 2010

The result from the above table: $\lambda_{Coal,y}$ = **97.14%,** $\lambda_{Oil,y}$ = **0.31%,** $\lambda_{Gas,y}$ = **2.55%.**

Sub-step 2. Calculating the fuel-fired emission factor

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$$

Where:
$EF_{Thermal}$ is the fuel-fired emission factor;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies.

These data were show as below:

Table 9 Emission factors of Coal, Oil and Gas with the most advanced commercialized technologies applied by the fuel-fired power plants

	Parameters	Fuel consumption rate(%)	Fuel Emission Factor($kgCO_2/TJ$)	Oxidation	Emission Factor（tCO_2/MWh）
		A	B	C	D=3.6/A/1000000*B*C
Coal-fired plant	$EF_{Coal,Adv}$	39.45	87,300	1	0.7967
Oil-fired plant	$EF_{Oil,Adv}$	51.77	75,500	1	0.5250
Gas-fired plant	$EF_{Gas,Adv}$	51.77	54,300	1	0.3776

Sources: The Baseline Emission Factors of Chinese Power Grids, NDRC.

Then, calculating
$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ = 0. 7852 tCO_2/MWh

Sub-step 3. Caculating the Build Margin Emission Factor.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:
$EF_{BM,y}$ = the Build Margin emission factor with advanced commercialized technologies for year *y*;
CAP_{Total} = the new capacity additions;
$CAP_{Thermal}$ = the new fuel-fired capacity additions.

Table 10 Installed Capacities of the ECPG 2009

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired	MW	16,540	52,420	43,300	26,790	18,920	157,970
Hydro	MW	0	1,140	9,560	1,620	10,980	23,300
Nuclear	MW	0	2,120	3,010	0	0	5,130
Wind&Others	MW	42.1	952.5	233.9	0	460	1,689
Total	MW	16,582	56,633	56,104	28,410	30,360	188,089

Sources：China Electric Power Yearbook 2010

Table 11 Installed Capacities of the ECPG 2008

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired	MW	16,780	50,680	40,990	24,820	15,430	148,700
Hydro	MW	0	1,140	8,960	1,560	10,580	22,240
Nuclear	MW	0	2,000	3,070	0	0	5,070
Wind&Others	MW	42.2	610	150	0	260	1,062
Total	MW	16,822.2	54,430	53,170	26,380	26,270	177,072

Sources：China Electric Power Yearbook 2009

Table 12 Installed Capacities of the ECPG 2007

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired	MW	14,150	53,340	39,490	17,760	13,910	138,650
Hydro	MW	0	140	8,520	1,510	9,800	19,970
Nuclear	MW	0	2,000	3,070	0	0	5,070
Wind&Others	MW	268.8	517.8	40	0	269	1,095.6
Total	MW	14,418.8	55,997.8	51,120	19,270	23,979	164,785.6

Sources：China Electric Power Yearbook 2008

Table 13 Installed Capacities of the ECPG 2006

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired	MW	14,526	51,776	35,391	14,134	13,001	128,828
Hydro	MW	0	136	8,369	1,001	8,957	18,463
Nuclear	MW	0	0	3,066	0	0	3,066
Wind&Others	MW	253	162	43	0	89	547
Total	MW	14,779	52,074	46,869	15,135	22,047	150,904

Sources：China Electric Power Yearbook 2007

Table 14 Change Installed Capacity from 2006-2009

	Year 2007	Year 2008	Year 2009	2007-2009 New Capacity	2008-2009 New Capacity	Percentage of New Capacity Additions
	B	C	D	E	F	G
Fuel-fired (MW)	138,650	148,700	157,970	44,336.5	29,812.3	84.33%
Hydro (MW)	19,970	22,240	23,300	5,032.2	3,396.2	9.57%
Nuclear (MW)	5,070	5,070	5,130	2,064	60	3.93%
Wind(MW)	1,096	1,062	1,689	1,142	584	2.17%
Total	**164,786**	**177,072**	**188,089**	**52,574.7**	**33,852.5**	**100.00%**
Percentage of Year 2009				27.95%	18.00%	

Then, the result is $EF_{BM,y} = EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$

$=0.7852\times 84.33\% = 0.6622$ tCO_2/MWh

Step 6. calculate the combined margin Emission Factor (EF_y)

$\boldsymbol{EF_{grid,CM,y}} = 0.5\times EF_{grid,OM,y} + 0.5\times EF_{grid,BM,y} = 0.5 \times 0.8367 + 0.5 \times 0.6622 =$ **0.7495** tCO_2/MWh

Appendix 5: Further background information on the monitoring plan

No additional information.

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
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