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

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NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

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

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

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Title: Animal Manure Treatment Programme in Henan Province and Shaanxi Province

Version: 02

Date: 06/04/2012

Version No	Date	Description and season of revision
01	25/10/2011	GSC Version
02	06/04/2012	Updated as per DOE comments

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

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1. General operating and implementing framework of PoA

Animal Manure Treatment Programme in Henan Province and Shaanxi Province (hereafter referred to as the PoA) is coordinated and managed by Zhongruihe International New Energy Science and Technology (Beijing) Co. Ltd. (hereafter referred to as the CME). The purpose of the PoA is to install animal manure treatment systems with recovery of biogas and then to utilize the generated biogas as fuel for energy generation across Henan Province and Shaanxi Province.

There are three scenarios for energy generation involved in the PoA, as follows:

1) Recovered biogas will be utilized to generate thermal energy supplied to the animal farm based on biogas boiler (the biogas boiler will be newly installed or be retrofitted from coal-fired boiler), and/or used as cooking fuel by the animal farm and/or nearby resident (biogas stove will be introduced), which could satisfy the heat demand of animal farm and/or nearby resident. (Hereafter referred to as **Scenario I**);

2) Recovered biogas will be utilized to generate electricity by newly installed electricity generator, and electricity generated will be delivered to the power grid and/or consumed for captive use. (Hereafter referred to as **Scenario II**);

3) One part of recovered biogas will be utilized to generate thermal energy supplied to the animal farm based on biogas boiler (the biogas boiler will be newly installed or be retrofitted from coal-fired boiler), and/or used as cooking fuel by the animal farm and/or nearby resident (biogas stove will be

introduced); Another part will be utilized to generate electricity by newly installed electricity generator, and electricity generated will be delivered to the power grid and/or consumed for captive use; which mean that recovered biogas will be utilized for thermal and power generation separately. (Hereafter referred to as **Scenario III**).

Biogas storage tank will be also installed in each **Scenario** 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. Besides, it is also possible that flaring system is installed in some activities and in this case, open flaring or closed flaring will be adopted based on each owner's opinion.

2. Policy measure or stated goal of the PoA

Stated goal of the proposed PoA is to establish a sustainable livestock waste management model that would significantly improve rural environment and reduce greenhouse gas emissions, through the use of a programmatic approach for biogas digester activities.

By recovery and utilization of biogas, the PoA can contribute to the reduction of greenhouse gases in 2 ways: 1) the biogas recovery system reduces methane emission into atmosphere; 2) the recovered biogas replaces conventional fossil fuels for energy generation, and therefore avoids CO_2 emissions from energy generation by the fossil fuel.

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

Social benefits:

- Provide job position during the Programme operation;
- Avoid epidemic disease spread from animal to people because of innocuous treatment of dung;

Environmental benefits:

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

Economic benefits:

- Reduce fuel, pesticide and fertilizer expenses, and therefore increase local rural farmers income;
- Move the development of animal raising industry forward, and furthermore increase the tax revenue ;

Technological benefits:

- Boost the development of application of biogas technology;

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

At present, there is no mandatory law to enforce animal raising entity to install animal manure treatment system with recovery of biogas in China. Therefore, the coordinating entity confirms that the proposed PoA is a voluntary action by the CME.

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

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Name of Party involved (*) (host indicates a host Party)	**Private and/or public entity(ies) project participants (*)** **(as applicable)**	**Kindly indicate if** **the Party involved wishes to be considered as project participant** **(Yes/No)**
The People's Republic of China (Host Country)	Zhongruihe International New Energy Science and Technology (Beijing) Co. Ltd.	No
United Kingdom of Great Britain and Northern Ireland	A&T Carbon Asset Co., Limited	No

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

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A.4.1. Location of the programme of activities:

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A.4.1.1. Host Party(ies):

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The People's Republic of China

A.4.1.2. Physical/ Geographical boundary:

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The programme is implemented in Henan Province and Shaanxi Province, so the boundary of the whole Henan Province and Shaanxi Province administrative area delineates the boundary of the Programme.

Detailed physical location labelled in Figure 1.

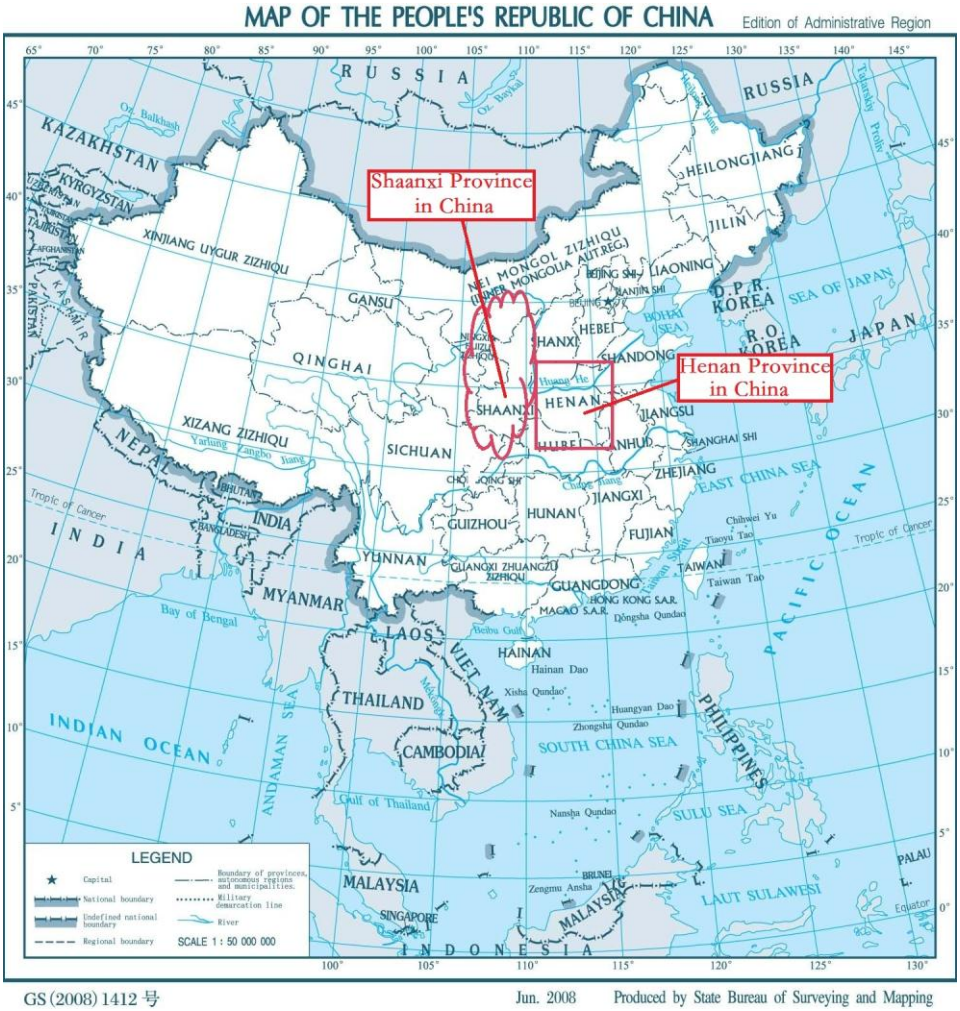

Figure 1. Location of the PoA

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

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

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All the CPAs under 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 energy generation. Energy generation in the PoA involves three scenarios (**Scenario I**, **Scenario II** and **Scenario III** as stated in A.2.).

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

The excrement 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 methanogen bacteria. The generated biogas will be recovered and then utilized for energy generation (It is also possible that a part of recovered biogas will be flared in some activities) 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:

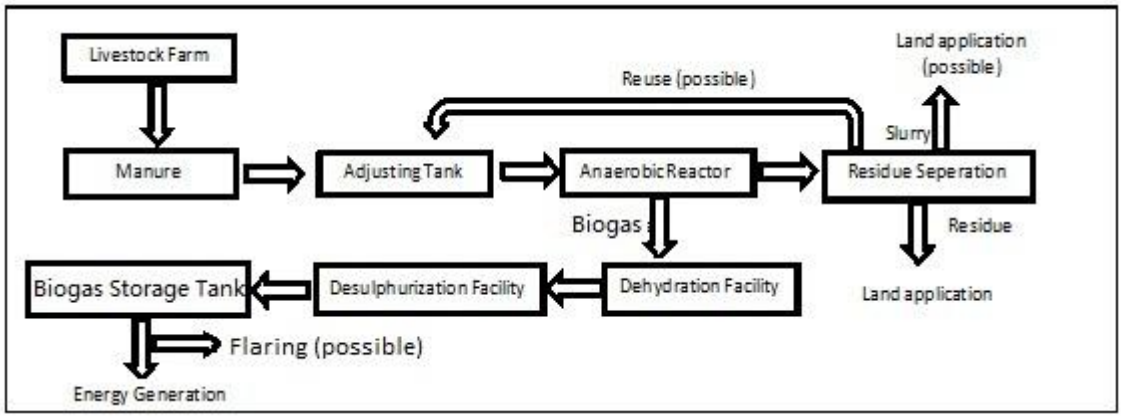

Figure 2. Technology flow adopted in the PoA

In the absence of the Programme, animal manure would be left to decay anaerobically in uncovered anaerobic lagoons without methane recovery and the equivalent amount of thermal energy would be generated based on coal fired as well as equivalent electricity would be generated by Central China Power Grid/Northwest Power Grid. This is also the baseline scenario.

By recovery and utilization of biogas, the PoA can contribute to the reduction of greenhouse gases in 2 ways: 1) the biogas recovery system reduces methane emission into atmosphere; 2) the recovered biogas replaces conventional fossil fuels for energy generation, and therefore avoids CO_2 emissions from energy generation by the fossil fuel;

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

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The criteria for inclusion of a CPA in the PoA are as below:

Common Criteria:

(1) The CPA should be located in the boundary of the PoA, i.e. within Henan Province or Shaanxi Province;

(2) The CPA should pass the procedure of avoiding double counting described in A.4.4.1 (ii);

(3) The CPA should meet any one of following criteria for assessing additionality:

(a) Meets relevant requirement in "*Guidelines for demonstrating additionality of microscale project activities*" (Ver. 04.0), including:

- The geographic location of the project activity is in a special underdeveloped zone of the host country identified by the Government via any one of the following methods:

  - 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;
  - 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;
  - 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 total installed capacity of the CPA is :

  For ***Scenario I***, the total installed capacity of the CPA is no more than $15MW_{th}$;

  For ***Scenario II***, the total installed capacity of the CPA is no more than $5MW_e$;

  For ***Scenario III***, 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 $15MW_{th}$;

- The emission reductions from type III components of the CPA is 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 "*Guidelines for demonstrating 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 of 7%;

(4) The CPA crediting period does not exceed 31/10/2040 (the PoA end date).

(5) There is no any activity[1] with the same sectoral scope, whose boundary is within 1km of the boundary of the proposed small-scale CPA.

(6) The start date of the CPA is not prior to 24/11/2011(GSC date of the PoA); Construction Agreement, Electricity Generator Purchasing Contract, Biogas Stove Contract and Biogas Boiler Contract involved in the CPA will be used to check the start date.

(7) Each activity included in the CPA must have obtained approval of EIA;

(8) The CPA has no public funding from Annex I Parties;

(9) No fossil fuel is used in each activity included in the CPA other than for transportation;

(10) Each activity included in the CPA will introduce newly anaerobic manure treatment systems with biogas recovery replacing uncovered anaerobic lagoons for animal manure treatment;

<u>Criteria Related to Applicability Conditions of AMS-III.D</u>

(11) All activities under the CPA are to install anaerobic animal manure management systems to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane;

For Scenario I

[1] 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 recovered methane will be used for thermal energy generation (including supplied to households as life fuel for thermal energy generation and utilized as fuel of boiler for thermal energy generation.).

For Scenario II

The recovered methane will be used for electricity generation by newly installed electricity generator.

For Scenario III

One part of the recovered methane will be used to generate thermal energy, another part will be used to generate electricity by newly installed electricity generator.

Biogas storage tank will be also installed in each **Scenario** 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. Besides, it is also possible that flaring system is installed in some activities.

(12) The livestock population in the farms included in the CPA under the PoA should be managed under confined conditions;

(13) Manure or the streams obtained after treatment are not discharged into natural water resources;

(14) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;

(15) In the baseline scenario the retention time of manure waste in the anaerobic treatment system should be greater than one month;

(16) The baseline scenario for the manure treatment is that the manure waste from the livestock would be treated in anaerobic lagoons with the depth of more than 1m;

(17) No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario;

(18) The residual waste from the animal manure management system must be handled aerobically, e.g. land application;

(19) Only animal manure will be anaerobically treated but no other organic matters are involved in the CPA;

(20) Technical measures will be used to ensure that all biogas produced by the digester is used or flared;

(21) 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.

(22) For CPA using option (c) of eligibility (3) for assessing additionality, to demonstrate that emission reductions from type III components of the CPA be less or equal to 60,000 tCO_2/yr.

Criteria Related to Different Combination Application of Methodologies

(23) The total installed capacity of the CPA is as below:

For ***Scenario I***, according to AMS-I.C., the total installed capacity of the CPA is no more than $45MW_{th}$;

For ***Scenario II***, according to AMS-I.F./AMS-I.D., the total installed capacity of the CPA is no more than $15MW_e$;

For ***Scenario III***, according to AMS-I.C. and AMS-I.F/AMS-I.D. as well as "General Guidelines to SSC CDM methodologies", 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 $45MW_{th}$;

(24) According to AMS-I.C./AMS-I.F, in case electricity and/or steam/heat and/or biogas produced by the project activity is delivered to another party, a contract between the supplier and the consumer(s) shall be signed to state that, only the supplier can claim emission reductions from the energy displaced.

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

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The following shall be demonstrated here:

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

At present, there is no mandatory law to enforce animal raising entity to install animal manure treatment system with biogas recovery in Henan Province or Shaanxi Province. Therefore, the proposed PoA is a voluntary coordinated action of the CME.

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

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 PCDM. In that case, all the CPAs under the PoA would not be implemented due to its additionality (details please see Section E.5.1). It is therefore decided that the Programme is best suited to those projects situation.

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

Not applicable as there is no mandatory law to enforce animal raising entity to install animal manure treatment system with biogas recovery 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 above.

Therefore, the anthropogenic emissions of GHG by sources that are reduced by CPAs under the PoA would have occurred in the absence of the registered PoA.

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

A.4.4.1. Operational and management plan:

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

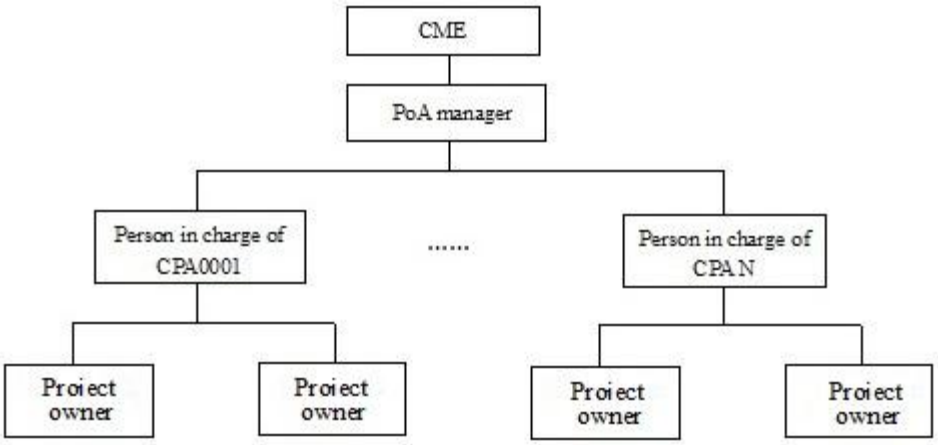


Figure 3. Operational and Management Structure

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

Entity	Responsibility description
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 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: - regularly 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;
CPA Manager	CPA manager assists the CME to manage the CPA, and collect the data and information related to the CPA, and then regularly report to the CME. Organize training for the related staff. Furthermore, the CPA manager will take in charge of monitoring implementation.
Project owner	Take in charge of operation and management of project activity, as well as assist CPA manager to conduct monitoring plan according to monitoring manual.

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

The CME will establish a database for recording the CPAs included in the PoA. Each CPA has exclusive information, including CPA number and title and etc. The information will be inputted and recorded by the CME.

The PoA involves a range of operational activities in order to effectively implement and manage each SSC-CPA. The CME has divided the technical and data operations into 3 steps and has defined the management responsibilities for each as detailed in the table below:

Procedure	Management Responsibilities & Arrangements
Material and data collection	- Searching for the potential activities; - Collecting the information and materials of potential activities according to the request list; - Collecting the monitoring data and materials of the activities which have been included already according to the request list; - Submit the information and materials collected to technical manager
Technical review	- Completeness check of the information and materials collected; - Implement the inclusion check according to the inclusion criteria list - Roughly calculate the ER
Filing and database management	- Rutinely update the PoA database; - Document filing and backup; - Report the findings and feedback from the database and filing management.

The PoA database will be updated companying with new CPA inclussion. A team designated by CME will be in charge of each procedure above and the CME will organize the relevant personnel to participate the training related to PoA before their duty.

The above steps could also be illustrated as the following figure:

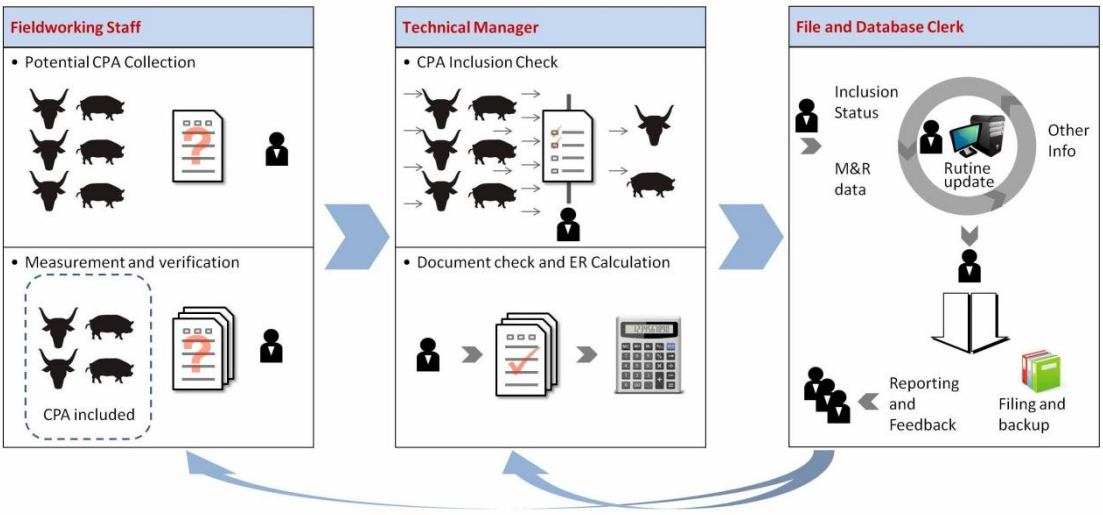


Figure 4. Management system of the PoA

All the staffs will be trained by the CME according to the training manual before start working, and the training record and compatency evaluation is made available to relevant PPs and the DOE. Besides, the CME will continuously train the staff during the PoA crediting period.

In addition to the above management tasks, the coordinating entity will implement the following operational elements to ensure proper management and oversight of the proposed PoA.

A comprehensive database including all activities in each CPA is set up. All the essential activity information mainly including the following variables is required:

- Activity name;
- Project activity owner name;
- Detailed location;
- Installed capacity;
- CDM monitoring and verification record.

The CME will be responsible for the management of records and data associated with each CPA. The potential activity will be numbered uniquely and registered in the database only if it would pass the eligible criteria checking. The activity status and information will be recorded and updated continuously and periodically during the PoA crediting period. The database will be made available to relevant PPs and the DOE. All the paper and electronic documents obtained by the CME will be filed and registered in the library system during the PoA crediting period plus 2 years.

(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

Two measures are taken to avoid double counting of emission reductions:

1. Declaration by the owner of activity is used to confirm that there will not be any double counting between this PoA and any other PoA/CDM project.

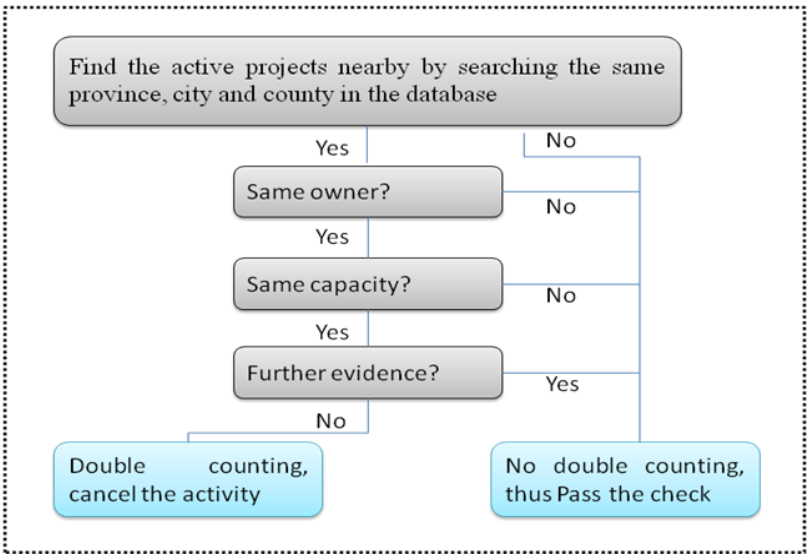
   Each of the owners included in the proposed CPA should sign a contract with the CME to confirm that：

   (a) They are aware of and have agreed that their activity is being subscribed to the PoA.

   (b) They have neither already been registered as a CDM project, nor as a CPA of another PoA.

2. Database checking will be applied to ensure that no activity could be double added into this PoA.

Before the activity registered in the database, a regular check is required to avoid double counting by the following steps:



Note: the further evidences mentioned in the above includes FSR, Approval of FSR, on-site photo and geographical coordinates of farm.

Thus, only the activity neither registered as a CDM, nor as a CPA of this or another PoA could be added in the PoA.

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

According to the Number (5) 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 owner of the project included in each CPA before inclusion of the CPA in the PoA. This is to ensure that all entities involved in the CPA operation are agreed that their activities are being subscribed to the PoA.

A.4.4.2. Monitoring plan:

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The CME has opted for verification of each CPA. Each CPA under the PoA will be monitored according to the related methodologies and tools. All relevant parameters included in the monitoring plan will be monitored and recorded for each included CPA respectively (Details please refer to Section E.7.2). Monitoring reports will be prepared separately for each of the CPAs for the purpose of verification and request for issuance of CERs. To guarantee the uncomplicated access to the CPA data, the CME will

maintain a database for all included CPAs. Based on the operation and management plan established by the CME, each CPA is uniquely identified. In this case, it is defined that the system is transparent and therefore ensures that no double accounting occurs.

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

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There is no public funding from Annex I parties for the programme of activities.

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

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

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01/11/2012 or the date of registration of the PoA, whichever is later. (starting date of crediting period)

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

>>
28 years

SECTION C. Environmental Analysis

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

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

Environmental Analysis is conducted based on each specific project. Thus, the Environmental Analysis is done at SSC-CPA level.

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

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The environment impacts of each CPA will be based on the Environment Impact Assessment (hereafter referred to as EIA) of each individual project in the CPA.

The environment impacts possibly caused by the project potentially included in the CPAs, and the corresponding measures may be adopted by the project owner are analyzed as followings:

1) Air pollution

The main impact brought by the construction of the projects under the CPA to the surrounding atmosphere is the dust generated during materials transportation, loading and unloading as well as mixing. The project owner tales certain measures to reduce the dust, maybe including: sprinkling water on the road, construction pause, covering the materials with canvas in windy weather and so forth. Moreover, the total quantity of air pollutants is small, and the pollution is intermittent and transient, therefore no significant effluence will be brought to the air. During operation period, main air pollutants are malodorous gases, which come from manure and urine in the course of storage and anaerobic fermentation. It will not cause serious impact on environment either due to the small quantity.

2) Noise

During construction period, noise is mainly generated due to machine operations and transportation vehicles. To reduce its impact on surrounding environment, the measures adopted by the construction unit may include: Arranging construction time reasonably, employing equipment with low noise and so on. What is more, the negative impacts will disappear along with the end of the construction period. During operating period, noise that is mainly caused by pumps, exhaust fan, mixer and dryer, is able to meet II level standard of *"Industrial Enterprise Boundary Noise Standard"*(GB12348-93). So the impact on environment resulted from noise is also slender.

3) Waste water

Wastewater generated during the construction period of the project comes from production and living usage. Production wastewater is only a small quantity and will be used for watering the construction site; wastewater from living usage will be treated in anaerobic lagoon and used for surrounding grassland irrigation, getting ecological benefits. The sewage generated during the operation period will be sent into the effluent lagoon and used for greening around the farm, which hence does not influence the natural water system.

4) Solid waste

During construction period of the project, solid waste mainly consists of residential garbage of the workers and the disposed soil and stones from construction. Residential garbage will be used for agricultural fertilization after being properly treated. Solid waste will be collected and sent to the nearby waste disposal station. During operation period, solid waste is mainly composed of biogas residue, dinas and residential garbage of the workers. Biogas residual will be provided to the local farmers for free and be used as organic fertilizer for agricultural land, the residential garbage and dinas will be sent to waste disposal station. Therefore, there is little environmental impact caused by solid waste.

5) Ecological environment

The project is to manage animal manure treatment and biogas recovery system, which is environmental-friendly and favorable to ecological sustainable development in local area; at the same time, it can avoid direct emission of CH_4 into atmosphere by displacing the uncovered anaerobic lagoon. In addition, utilizing animal manure and the recovered biogas, the project can develop renewable energy with zero emission, alleviating the reliance on fossil fuel in traditional energy provision. It also reduces the emissions of air pollutants such as SO_2, and NOx, improves air quality, and reduces GHG emissions of CO_2. The use of waste residue and effluent as organic fertilizers can improve soil quality and fertility, and thus sustainable development in agricultural sector will be achieved. The project will benefit local ecological environment.

In summary, the project will not bring significant impacts on the environment, and the negative aspects will be controlled to the lowest level after taking the protection measures mentioned above. On the other hand, the project can benefit local environment through effective manure treatment and utilization of biogas.

Therefore, there is no significant negative environment impact of the CPA.

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

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The EIA will be carried out and approved by local environmental protection bureau before the starting of each CPA under the PoA. Therefore, CPAs included in the PoA is in accordance with the national laws/regulations.

SECTION D. Stakeholders' comments

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

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

Considering the CPAs under the PoA are similar, the local stakeholder consultation is done at PoA level.

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

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The CME posted notice (Henan Province post the notice on its official website (http://hnnh.haagri.gov.cn/asp/showdetail.asp?id=97986); Shaanxi Province distributed the notice to the municipal governments) to let the stakeholders know the PoA before stakeholder consultation. In addition, questionnaires were randomly given out in each city between 08/10/2011 and 14/10/2011. Total 140 questionnaires are distributed and 140 questionnaires are returned, with 100% response rate. The questionnaire includes:

1) Local economic impact of the project;

2) Local ecological impact of the project;

3) Local job impact of the project;

4) The possible negative impact to the local area;

5) The overall attitudes to the project;

6) Other comments and/or suggestions.

D.3. Summary of the comments received:

>>

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

All respondents are in favor of the PoA, no respondent stated objection; 85 respondents (61%) believe the projects under the PoA will be helpful to improve the situation of local employment; 101 respondents (72%) think the projects under the PoA will do not put negative impact on local ecological environment; 134 respondents (96%) believe the projects under the PoA can bring positive impacts to local economic development. No respondent offers any suggestion regarding the negative impacts of the projects under the PoA; 2 of them expressed the opinion, that implementing and promoting the PoA as soon as possible, which is helpful to eliminate the current negative impacts on the environment brought by the farms.

The returned questionnaires show that the PoA is supported by local residents and will bring various positive impacts to the local area.

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

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The survey shows that the PoA is supported by local residents and will take positive impact on various aspects, and no negative impacts will be caused by the projects under the PoA. Therefore the CME will fully consider the comments and suggestions given by the stakeholders during the implementation and promotion of the PoA, and will keep communication with the public during the process.

SECTION E. Application of a baseline and monitoring methodology

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

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AMS-III.D.: "Methane recovery in animal manure management systems" (Ver. 18), ***AMS-I.C.: "Thermal energy production with or without electricity"*** (Ver. 19.0), ***AMS-I.D.: "Grid connected renewable electricity generation"*** (Ver. 17.0) and ***AMS-I.F.:"Renewable electricity generation for captive use and mini-grid"*** (Ver. 02.0) will be applied in the PoA.

For more information, please refer to:

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

Multiple combinations of methodologies based on various **Scenarios** will be used in the PoA.

For Scenario I

AMS-III.D.: "Methane recovery in animal manure management systems" and

AMS-I.C.: "Thermal energy production with or without electricity"

For scenario II

This scenario can be further divided into two scenarios based on methodology application, which are electricity generation for captive use (Hereafter referred to as **Scenario IIa**) and grid connected electricity generation (Hereafter referred to as **Scenario IIb**).

Scenario IIa

AMS-III.D.: "Methane recovery in animal manure management systems" and

AMS-I.F.: "Renewable electricity generation for captive use and mini-grid"

Scenario IIb

AMS-III.D.: "Methane recovery in animal manure management systems" and

AMS-I.D.: "Grid connected renewable electricity generation"

For Scenario III

This scenario can also be further divided into two scenarios based on methodology application, which are electricity generation for captive use (Hereafter referred to as **Scenario IIIa**) and grid connected electricity generation (Hereafter referred to as **Scenario IIIb**).

Scenario IIIa

AMS-III.D.: "Methane recovery in animal manure management systems", ***AMS-I.C.: "Thermal energy for production with or without electricity"*** and ***AMS-I.F.: "Renewable electricity generation for captive use and mini-grid"***

Scenario IIIb

AMS-III.D.: "Methane recovery in animal manure management systems", ***AMS-I.C.: "Thermal energy production with or without electricity"*** and ***AMS-I.D.: "Grid connected renewable electricity generation"***

Those methodologies also refer to:

"Tool to determine project emissions from flaring gases containing methane" (Ver. 01) and

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

"Tool to determine the remaining lifetime of equipment" (Ver. 01) and

"Guidelines for demonstrating additionality of microscale project activities" (Ver. 04.0) and

"Guidelines on the Demonstration of Additionality of Small-scale Project Activities" (Ver.09.0)

For more information, please refer to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

As per methodologies above, each of them is approved for use in a PoA.

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

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Each CPA under the PoA meets 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;	As per eligibility criteria (12) for inclusion of a CPA in the PoA described in the Section A.4.2.2, the livestock population in the farms included in each CPA under the PoA is managed under confined conditions;
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;	As per eligibility criteria (13) for inclusion of a CPA in the PoA described in the Section A.4.2.2, manure or the streams obtained after treatment 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;	As per eligibility criteria (14) for inclusion of a CPA in the PoA described in the Section A.4.2.2, it can be met.
4	In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m;	According to eligibility criteria (15) and (16) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, it can be met.
5	No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	According to eligibility criteria (17) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, it can be met.
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;	According to eligibility criteria (18) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, the residual waste from the animal manure management system will be handled aerobically in each

		CPA under the PoA.
7	Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	According to eligibility criteria (20) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, it is ensured that all biogas produced by the digester is used or flared;
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.	According to eligibility criteria (21) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, the storage time of the manure after removal from the animal barns, including transportation, will not exceed 45 days before being fed into the anaerobic digester.
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".	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, each CPA under the PoA will introduce anaerobic manure treatments with biogas recovery to treat only animal manure.
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 utilized for generation of heat and/or electricity.
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" (Ver. 17).	According to eligibility criteria (10) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, each activity included in the CPA will introduce newly anaerobic manure treatment systems with biogas recovery. In addition, according to

		eligibility criteria (22) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, it meets the related and relevant requirements in the "*General Guidelines to SSC CDM methodologies*" (Ver. 17).
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" (Ver. 17).	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.	According to eligibility criteria (22) for inclusion of a CPA in the PoA described in the Section A.4.2.2, it can be met.

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

AMS-I.C will be applied in the CPA under **Scenario I** or **III**. 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 **Scenario I** or **III**
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.	According to eligibility criteria (11) for inclusion of a CPA in the PoA described in the Section A.4.2.2, each CPA under the PoA will utilize biogas displacing fossil fuel to provide thermal energy under **Scenario I** or **III**.
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).	Cogeneration is not involved in a CPA. Therefore, this applicability condition is not relevant.
3	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	According to eligibility criteria (23) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the total installed

		capacity of each CPA under the PoA is less than 45 MW thermal.
4	For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel shall not exceed 45 MW thermal.	According to eligibility criteria (9) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, each CPA under the PoA does not involve fossil fuel use other than for transportation, so this applicability condition is not relevant.
5	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 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.	Cogeneration is not involved in the PoA and this criterion is therefore not relevant.
6	In case electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions	According to eligibility criteria (24) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the supplier will sign contract with consumers to state that, only the supplier can claim emission reductions from the energy displaced.

7	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	Retrofit existing coal fired boiler into biogas fired boiler may be involved in CPAs under **Scenario I** or **III**, which meets this applicability condition.
8	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 and should be physically distinct from the existing units.	Addition of renewable energy units at an existing renewable energy facility is not involved in each CPA under **Scenario I** or **III.**
9	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided:	This application condition is not relevant, since each CPA under the PoA does not involve charcoal based biomass energy generation.

According to analysis above, AMS-I.C. is applicable to **Scenario I** or **III.**

AMS-I.F will be applied in CPAs under the **IIa** or **IIIa**. 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 **Scenario IIa** or **IIIa**
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.	All activities under **Scenario IIa** and **IIIa** are to recover and utilize biogas for electricity generation for captive use. The electricity generated by each activity will displace electricity from 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.	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.	Electricity generated by each activity under **Scenario IIa** or **IIIa** will be consumed for captive purpose, but not be supplied to a grid.

4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	This criterion is not relevant because those activities are all 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.	No biomass other than biogas will be used in activities included in a CPA.
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).	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the electricity generator is newly installed. i.e.Greenfield plant.
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.	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the electricity generator is newly installed. 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.	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the electricity generator is newly installed. i.e. Greenfield plant. Therefore, this applicability condition is not relevant.
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.	According to eligibility criteria (9) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, no fossil fuel is used in each activity included in the CPA other than for transportation. 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 a third party i.e. 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 that ensures that there is no double counting of emission reductions.	According to eligibility criteria (24) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the supplier will sign contract with consumers to state that, only the supplier can claim emission reductions from the energy displaced.

According to analysis above, AMS-I.F. is applicable to **Scenario IIa** and **IIIa.**

AMS-I.D will be applied in CPAs under the **IIb** or **IIIb**. Application criteria as per AMS-I.D is analysed as follows:

	Applicability Conditions as per AMS-I.D	Situation of **Scenario IIb** and **IIIb**
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.	For **Scenario IIb** and **IIIb**, electricity generated by biogas utilization will be supplied to Power Grid.
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).	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the electricity generator is newly installed. i.e. Greenfield plant. Therefore, this applicability condition is not relevant.
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	This applicable condition is not relevant as the PoA is not hydro power plants.

	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.	
5	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.	According to eligibility criteria (9) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, no fossil fuel will be added in the activities under the CPA other than for transportation, as well as the total installed capacity of the Project does not exceed the limit of 15 MW.
6	Combined heat and power (co-generation) systems are not eligible under this category.	Co-generation is not involved in the PoA.
7	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	According to eligibility criteria (11) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the electricity generator is newly installed. 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.	According to eligibility criteria (23) for inclusion of a SSC-CPA in the PoA described in the Section .4.2.2, the total output will not exceed 15MWe.

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 in Section E.1 are eligible to be adopted in the PoA.

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

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As per Methodology AMS-III.D, AMS-I.C., AMS-I.D. and 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 needs to purchase or replace electricity from Central China Power Grid (hereafter referred to as CCPG)/Northwest Power Grid (hereafter referred to as NWPG), the SSC-CPA boundary also includes power plants connected to CCPG and/or NWPG. 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 consumption /generation	CO_2	Included	This source of emissions will be included in the baseline only in the case of **Scenario II** or **III**
		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	This source of emissions will be included in the baseline only in the case of **Scenario I** or **III**
		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	CH_4	Included	The major source of emissions in case flaring is involved.
		CO_2	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from on-site electricity use	CO_2	Included	The major source of emissions
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from on-site fossil fuel fired	CO_2	Excluded	Fossil fuel is not involved in the PoA other than for transportation.
		CH_4	Excluded	Fossil fuel is not involved in the PoA other than for transportation.
		N_2O	Excluded	Fossil fuel is not involved in the PoA other than for transportation.
	Emissions from incremental transportation distances	CO_2	Included	This source of emissions shall be accounted for if transportation distance increases after implementation of the CPA
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Emissions from the storage of	CH_4	Included	This source of emissions shall be accounted for if both condition (a) and condition (b) below are satisfied:

	manure before being fed into the anaerobic digester			(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.

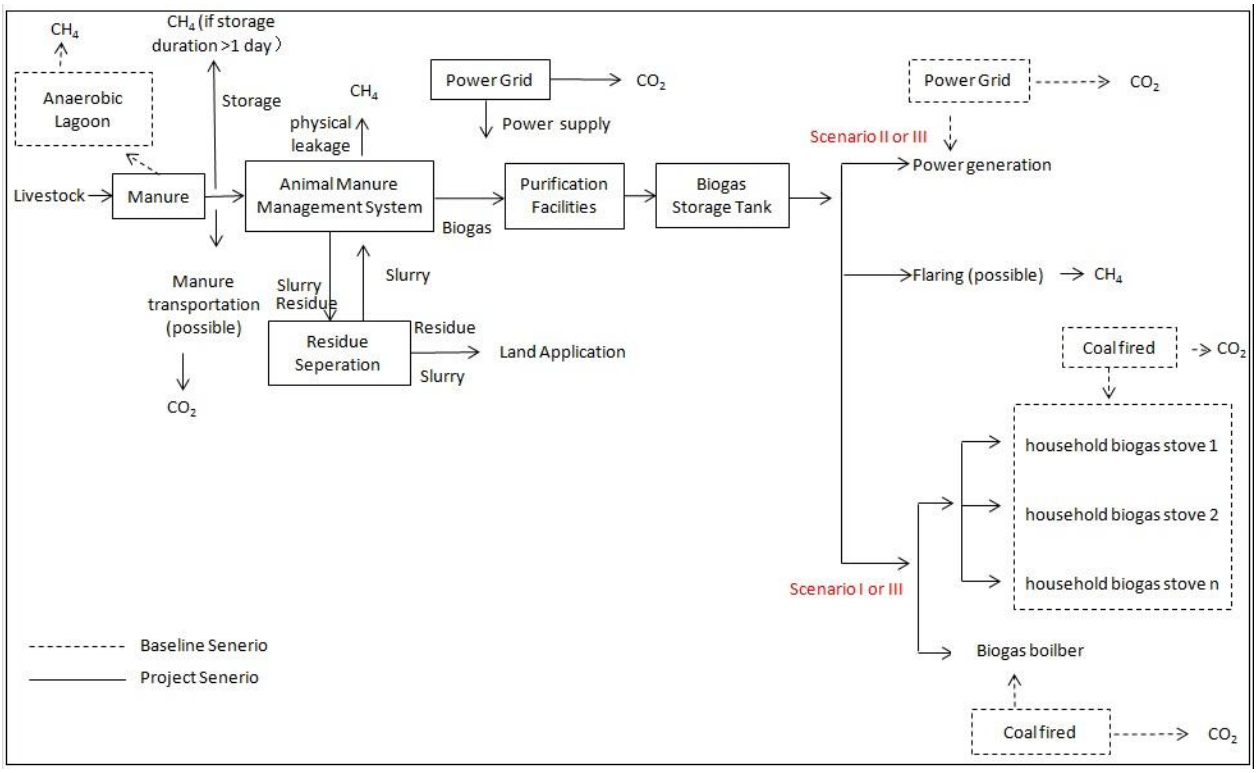

Figure 5. project boundary

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

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

According to eligibility criterion (16) and (17) for inclusion of a SSC-CPA in the PoA described in the Section A.4.2.2, the baseline for animal manure management is the treatment of animal manure in uncovered anaerobic lagoons without methane recovery. This type of manure management is common

practice in Henan Province and Shaanxi Province.

According to 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 coal offers a high availability throughout the entire year and is much cheaper than natural gas, biomass or other types of fuel, coal is the main cooking fuel used in rural areas in Henan Province and Shaanxi Province. Publicly available default values will be used for the emission factor.

As per AMS-I.D and AMS-I.F, the baseline of electricity generation is that the equivalent electricity would be generated by Central China Power Grid/Northwest Power Grid.

We can conclude from above that, the baseline scenario for a CPA is as below,

For **Scenario I**, animal manure is treated in uncovered anaerobic lagoons without methane recovery and the generated methane is directly emitted to atmosphere, and the equivalent amount of thermal energy is generated based on fossil fuel.

For **Scenario II**, animal manure is treated in uncovered anaerobic lagoons without methane recovery and the generated methane is directly emitted to atmosphere, and the equivalent electricity is generated by Central China Power Grid/Northwest Power Grid.

For **Scenario III**, animal manure is treated in uncovered anaerobic lagoons without methane recovery and the generated methane is directly emitted to atmosphere, and the equivalent amount of thermal energy is generated based on fossil fuel, as well as the equivalent electricity is generated by Central China Power Grid/Northwest Power Grid.

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

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

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The following EB guidance and tool are referred to for demonstration of the CPA additionality:

"Guidelines for demonstrating additionality of microscale project activities" (Ver. 04.0)*, and*

Guidelines on the Demonstration of Additionality of Small-scale Project Activities (Ver. 09.0)

The additionatlity of a CPA will be assessed as per any one of the three approaches as below:

Approach 1

The criteria of "Microscale Project Activity"related to this PoA could be summarized as the following table.

No.	Criteria in the guideline	Detailed criteria for the CPA under the PoA	Real situation of the CPA	Applicable ? (Y/N)
1	Project activities up to five megawatts that employ renewable energy technology	The total installed capacity of the CPA is : For ***Scenario I***, the total installed capacity of the CPA is no more than $15MW_{th}$; For ***Scenario II***, the total installed capacity of the CPA is no more than $5MW_e$; For ***Scenario III***, 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 $15MW_{th}$;		
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 Countries (LDCs/SIDs) or in a special underdeveloped zone of the host country identified by the Government via any one of the following methods: - 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; - 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; - 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 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: - 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; - 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; - 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.		

According to the paragraph 2 (a) and 4 (a) of "*Guidelines for demonstrating additionality of microscale project activities*" (Ver.04.0), project activities are additional if the conditions above are satisfied.

Approach 2

According to the paragraph 2 (c) of "*Guidelines for demonstrating additionality of small-scale project activities*" (Ver.09.0), 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 (22) and (23), 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 households or communities or Small and Medium Enterprises (SMEs)	All the equipment units 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.		

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

Approach 3

The CPA is additional only if all the projects under the CPA are proved to be additional according to the "**Guidelines on the Demonstration of Additionality of Small-scale Project Activities**" (Ver. 09.0)

According to the "**Guidelines on the Demonstration of Additionality of Small-scale Project Activities**" (Ver. 09.0), 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.

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*" (Ver. 06.0.0) 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

Step 1 Determine appropriate analysis method

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

Since each project under the CPA 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 project in the CPA has more output service than the baseline scenario (mainly includes the biogas supply to the rural people), 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.

Step 2 Determine the benchmark

The project IRR (before tax) of 7% is suggested for the livestock industry in the *Economic Evaluation Code for Construction of Project* (Ver.03), which is selected as the financial benchmark for the project under the CPA. Only if the project IRR of the project is higher than or equivalent to the benchmark, the project is financially feasible.

Step 3 Calculation and comparison of financial indicators

Basic parameters for calculation of financial indicators of each project will be shown as the table below.

Table 2. Financial Parameters of a project in the CPA

Parameter	Value	Units	Source
Fixed asset investment			
Annual biogas output			
Biogas sale price			
Coal saving			
Coal price			
Annual electricity output			
Electricity price			
Project lifetime (include construction period)			
Annual O&M cost			
Value added tax rate			
Income tax rate			
Expense for city maintenance and construction			
Education fee addition			
CER price	EU 8 /tCO_2e		

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, it is not considered this CPA is financially attractive if the project IRR without additional revenue is lower than 7% (benchmark IRR).

(4) Sensitivity analysis

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

- Fixed assets investment
- Annual O&M cost
- Annual revenues

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

If the project IRR of a typical SSC-CPA could not reach the benchmark even within a reasonable variation range of the factors, then the CPA is additional.

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

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As demonstrated in the section E.5.1, the key criteria for assessing the Additionality of a CPA would be either Approach 1 or Approach 2 or Approach 3 as follows:

Approach 1: *"Guidelines for demonstrating additionality of microscale project activities"* (Ver. 04.0)

- The CPA meets the applicability conditions listed in the guideline above.

Or

Approach 2: projects fall into the positive list are defined as automatically additional as per "**Guidelines on the Demonstration of Additionality of Small-scale Project Activities**" (Ver. 09.0).

- The CPA meets the applicability conditions listed in the guideline above.

Or

Approach 3: the guidance provided by "**Guidelines on the Demonstration of Additionality of Small-scale Project Activities**" (Ver. 09.0)

- The CPA is demonstrated by investment barrier analysis.

Any one of the above Approach will be demonstrated in a typical CPA.

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

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

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For Scenario I

Combination application of ***AMS-III.D.: "Methane recovery in animal manure management systems"*** and ***AMS-I.C.: "Thermal energy production with or without electricity"*** will be adopted in CPAs under **Scenario I**.

For scenario II

Scenario IIa

Combination application of ***AMS-III.D.: "Methane recovery in animal manure management systems"*** and ***AMS-I.F.: "Renewable electricity generation for captive use and mini-grid"*** will be used in CPAs under **Scenario IIa**.

Scenario IIb

Combination application of ***AMS-III.D.: "Methane recovery in animal manure management systems"***; and ***AMS-I.D.: "Grid connected renewable electricity generation"*** will be used in CPAs under **Scenario IIb**

For Scenario III

Scenario IIIa

Combination application of ***AMS-III.D.: "Methane recovery in animal manure management systems"***, ***AMS-I.C.: "Thermal energy production with or without electricity"*** and ***AMS-I.F.: "Renewable electricity generation for captive use and mini-grid"*** will be used in CPAs under **Scenario IIIa**.

Scenario IIIb

Combination application of ***AMS-III.D.: "Methane recovery in animal manure management systems"***, ***AMS-I.C.: "Thermal energy production with or without electricity"*** and ***AMS-I.D.: "Grid connected renewable electricity generation"*** will be used in CPAs under **Scenario IIIb**.

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

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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. The baseline emission is calculated as follows:

$$\begin{cases} BE_y = BE_{CH4,y} + BE_{Thermal,y} & \text{Only applicable under Scenario I} \\ BE_y = BE_{CH4,y} + BE_{\mathrm{Ele},y} & \text{Only applicable under Scenario II} \\ BE_y = BE_{CH4,y} + BE_{Thermal,y} + BE_{\mathrm{Ele},y} & \text{Only applicable under Scenario III} \end{cases} \quad (1)$$

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, $BE_{CH4,y}$ is calculated by using one of the following two options:

(c) 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);

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

Option (a) is adopted in a CPA, which is as below:

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

Where:

$BE_{CH4,y}$	Baseline emissions duet 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)[2]

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. 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.

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:

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

[2] 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

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.

Country-specific *MCF* is unavailable, the IPCC default values will therefore be adopted in a typical SSC-CPA.

Determination of $N_{LT,y}$

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

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

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 will be involved in the case of **Scenario I** or **III,** which includes supplying biogas to households as life fuel for thermal energy generation and utilizing biogas as fuel of boiler for thermal energy generation.

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

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_2)
$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the project activity using renewable biogas during the year *y* (tCO_2)

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". If the remaining lifetime of the affected systems increases due to the project activity, the crediting period shall be limited to the estimated remaining lifetime, i.e. the time when the affected systems would have been replaced in the absence of the project activity.

According to "General Guidelines to SSC CDM methodologies", in case of replacement of existing equipment, project participants shall estimate the point in time where the existing equipment would be replaced in the absence of the project activity in accordance with the latest version of "Tool to determine the remaining lifetime of equipment" (Ver.01). For household devices/ appliances, the remaining lifetime may be disregarded.

Therefore, in case replacement of existing coal-fired boiler by biogas-fired boiler is involved in a CPA, the remaining life time of the existing coal-fired boiler should be determined.

According to "Tool to determine the remaining lifetime of equipment" (Ver.01), Project participants may use one of the following options to determine the remaining lifetime of the equipment:

(a) Use manufacturer's information on the technical lifetime of equipment and compare to the date of first commissioning;

(b) Obtain an expert evaluation;

(c) Use default values;

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

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

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 by biogas boiler
$EF_{FF,CO2}$	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 boiler 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 in the PoA.

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:

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

Where:

$BE_{thermal,y,2}$	The baseline emissions from thermal energy displaced by the project activity using renewable biogas during the year *y* (tCO_2)
$HG_{PJ,y}$	The net quantity of thermal energy supplied by the project activity using biogas during the year *y* (TJ)
η_{BL}	Efficiency of the baseline equipment being replaced by biogas stove.
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 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 (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., efficiency of the baseline units replaced by biogas stoves 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 in the PoA.

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

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

$$BE_{Ele,y} = EG_{BL,y} \times EF_{grid,CM,y} \quad (8)$$

Where:

$EG_{BL,y}$	Quantity of electricity supplied to and/or displaced from the grid as a result of the implementation of the CDM 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*" (Ver. 02.2.1);

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

According to the *"Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1), 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	SI 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"* (Ver. 02.2.1) *(*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 CCPG and/or NWPG. CCPG is composed of the local power grids covering Chongqing City, Henan, Sichuan, Hubei, Jiangxi and Hunan Province. NWPG is composed of the local power grids covering Shaanxi Province, Qinghai Province, Gansu Province, Ningxia Hui Autonomous Region, Xinjiang Wei Autonomous Region. Therefore, the project selects the CCPG/NWPG for the calculation of electricity emission factor.

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) During the most recent 5 years, from 2005 to 2009 the hydroelectricity, nuclear-electricity and other low-cost/must run resources annual proportion in CCPG is 38.18%, 35.12%, 35.46%, 39.43% and 37.87%, from year 2005 to year 2009 respectively[3], which are much less than 50%.

During the most recent 5 years, from 2005 to 2009 the hydroelectricity, nuclear-electricity and other low-cost/must run resources annual proportion in NWPG is 27.44%, 24.71%, 23.15%, 21.86% and 24.96% from year 2005 to year 2009 respectively[4], which are much less than 50%.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: A 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

- Ex post option: The year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required calculating the emission factor for year y usually only available later than six months after the end of year y.

Project participant employs “ex-ante” for its operation margin calculation with two reasons as follows:

1) The full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission; and

[3] China Energy Statistical Yearbook, 2005 to 2009, China Electric Power Yearbook 2005 to 2009.

[4] China Energy Statistical Yearbook, 2005 to 2009, China Electric Power Yearbook 2005 to 2009.

2) The calculation adopts *Notification on Determining Baseline Emission Factor of China's Grid (20th Oct. 2011)*, which is published by Chinese DNA, therefore it is considered as authoritative data. In this notification, the OM is calculated *ex-ants*.

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"* (Ver. 02.2.1), ($EF_{grid,simple,OM}$) 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:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \qquad (9)$$

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 import 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 Section A of Annex 3, for CCPG, the $EF_{grid,OM,y}$ = **1.0297** tCO_2/MWh

The detailed calculation can be find in Section B of Annex 3, for NWPG, the $EF_{grid,OM,y}$ = **1.0001** 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 $EF_{grid,BM,y}$.

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (10)$$

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[5]:

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

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (11)$$

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

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (12)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{iy} \times EF_{i,j,y}} \quad (13)$$

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 (tCO_2/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

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} \quad (14)$$

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.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (15)$$

Where $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ 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 Section A of Annex 3, for CCPG, the $EF_{grid,BM,y}$ = **0.4191** tCO_2/MWh.

The detailed calculation can be find in Section B of Annex 3, for NWPG, the $EF_{grid,BM,y}$ = **0.5851** tCO_2/MWh.

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

Based on the *Tool*, 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

$$EF_{grid,CM,y} = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y} \quad (16)$$

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

For CCPG, $EF_{grid,CM,y}$=0.5×1.0297+0.5×0.4191=0.72440 (tCO_2e/MWh).

For NWPG, $EF_{grid,CM,y}$=0.5×1.0001+0.5×0.5851=0.79260 (tCO_2e/MWh).

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;

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

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad (17)$$

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

2. **Determination of** $PE_{PL,y}$

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

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y} \quad (18)$$

Where:

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

3. **Determination of** $PE_{flare,y}$

In case flaring is involved in a CPA, the emission from flaring of biogas will be taken into account. According to AMS-III.D., this emission should be calculated as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times \left(1 - \eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000} \quad (19)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of biogas in year y (tCO_2e)
$TM_{RG,h}$	Mass flow rate of methane in 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)

For simplification and conservative, 0 is used for flare efficiency of flaring system. i.e.

$$\boldsymbol{\eta_{flare,h}} = 0$$

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (20)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in biogas in the hour h; (kg/h)
$FV_{RG,h}$	Volumetric flow rate of biogas in dry basis at normal conditions in hour h;(m^3/h)
$fv_{CH4,RG,h}$	Volumetric fraction of methane in biogas on dry basis in hour h; according to AMS-III.D., 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 a typical SSC-CPA other than for transportation, $PE_{power,y}$ 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 "Grid connected renewable electricity generation", which is calculated as below:

$$PE_{power,y} = EC_{PJ,y} \times EF_{grid,CM,y} \quad (21)$$

Where:

$EC_{PJ,y}$	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*" (Ver. 02.2.1);

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

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

$$PE_{y,transp} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (22)$$

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)

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

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

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

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

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

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k\ (AI_l - d)}) * MCF_l * B_{0_{LT}})\right] \quad (23)$$

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 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, AMS-I.D., and AMS-I.F., leakage can be neglected.

IV. Calculate Emission Reductions

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

$$ER_y = BE_y - PE_y \tag{24}$$

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:

$$ER_{CH4,y,ex\,post} = \min[(BE_{CH4,y,ex\,post} - PE_{CH4,y,ex\,post}),(MD_y - PE_{power,y,ex\,post})] \tag{25}$$

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 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)

MD_y will be determined as below:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \tag{26}$$

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	Combustion efficiency of biogas utilized for energy generation in year (fraction)

At room temperature (20 ºC) and 1 atm pressure i.e. normal condition, CH_4 density is 0.00067 t/m^3. If the measured volume of biogas is not in normalized cubic meters, this parameter will be corrected by using actual temperature and pressure of biogas based on state equation of ideal gas, as below:

$$D_{CH4} = 0.00067 \times \frac{293 \times P}{1 \times (273 + T)} \quad (27)$$

Where:

T	Temperature of the biogas at the flow measurement site; (ºC)
P	Pressure of the biogas at the flow measurement site; (atm)
0.00067	CH_4 density at room temperature and 1 atm pressure; (t/m^3)
293	Thermodynamic temperature corresponding to normal condition; (K)
273	The parameter for unit conversion from celsius temperature to thermodynamic temperature; (K)
1	Pressure corresponding to normal condition; (atm)

Therefore, emission reductions achieved by a SSC-CPA during a given year can be calculated ex-post as below:

$$ER_{y,ex\,post} = \min[(BE_{y,ex\,post} - PE_{y,ex\,post}), (MD_y + BE_{\text{Energy},y,ex\,post} - PE_{power,y,ex\,post})] \quad (28)$$

Where:

$ER_{y,ex\,post}$	Emission reductions achieved by the CPA based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\,post}$	Baseline emissions calculated using equation (1) using *ex post* monitored values in year y (tCO_2e)
$PE_{y,ex\,post}$	Project emissions calculated using equation (17) using *ex-post* monitored values in year y (tCO_2e)
MD_y	Methane captured and used gainfully by the CPA in year *y* (tCO_2e)
$BE_{\text{Energy},y,ex\,post}$	Baseline emissions from energy generation using *ex post* monitored values in year y (tCO_2e)
$PE_{power,y,ex\,post}$	Emissions from the use of fossil fuel or electricity for the operation of the CPA based on monitored values in the year *y* (tCO_2e)

The parameter of $BE_{\text{Energy},y,ex\,post}$ will be calculated as below:

$$\begin{cases} BE_{Energy,y,ex\,post} = BE_{\text{Theraml},y,ex\,post} & \text{Only applicable under Scenario I} \\ BE_{Energy,y,ex\,post} = BE_{\text{Ele},y,ex\,post} & \text{Only applicable under Scenario II} \\ BE_{Energy,y,ex\,post} = BE_{\text{Theraml},y,ex\,post} + BE_{\text{Ele},y,ex\,post} & \text{Only applicable under Scenario III} \end{cases} \quad (28)$$

Where:

$BE_{\text{Theraml},y,ex\,post}$	Baseline emissions from thermal generation using equation (5) and the related equation using the *ex post* monitored values in year y (tCO_2e)
$BE_{\text{Ele},y,ex\,post}$	Baseline emissions from electricity generation using equation (8) using the *ex post* monitored values in year y (tCO_2e)

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

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

Data / Parameter:	D_{CH4}
Data unit:	t/m^3
Description:	CH_4 density
Source of data used:	AMS III.D.
Value applied:	0.00067
Justification of the choice of data or description of measurement methods and procedures actually applied :	Recommended by the methodology.
Any comment:	at room temperature (20 ºC) and 1atm pressure

Data / Parameter:	MCF_j
Data unit:	%
Description:	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data used:	IPCC 2006 table10.17

Value applied:	Please see individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS III.D., when national special value is unavailable, IPCC default value is used.
Any comment:	-

Data / Parameter:	UF_b
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	AMS-III.D.
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS-III. D is credible data source.
Any comment:	-

Data / Parameter:	$B_{O,LT}$
Data unit:	m^3/CH_4/kg dm
Description:	Maximum methane producing potential of the volatile solid generated for animal type “LT”
Source of data used:	IPCC 2006 table10A-7 and 10A-8
Value applied:	Please see individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS III.D., when national special value is unavailable, IPCC default value is used.
Any comment:	-

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

Any comment:	-

Data / Parameter:	$W_{default}$
Data unit:	kg
Description:	Default average animal weight of a defined population
Source of data used:	Table10A-7 and 10A-8 in IPCC 2006
Value applied:	Please see individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value is credible data source.
Any comment:	-

Data / Parameter:	$VS_{default}$
Data unit:	kg dm/animal/day
Description:	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population
Source of data used:	Table10A-7 and 10A-8 in IPCC 2006
Value applied:	Please see individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value is credible data source.
Any comment:	-

Data / Parameter:	EG_y
Data unit:	MWh
Description:	net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data used:	*China Electric Statistical Yearbook, 2008-2010*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use accurate and reliable local or national data where available.
Any comment:	Reasonable

Data / Parameter:	$FC_{i,y}$
Data unit:	mass or volume unit
Description:	Amount of fossil fuel type i consumed in the project electricity system in year y

Source of data used:	*China Energy Statistical Yearbook, 2008-2010*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use accurate and reliable local or national data where available.
Any comment:	Reasonable

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mass or volume
Description:	The fuel consumption of fuel i in power plant j during year y
Source of data used:	*China Energy Statistical Yearbook, 2008-2010*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use accurate and reliable local or national data where available.
Any comment:	Reasonable

Data / Parameter:	$NCV_{i,y}$
Data 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 used:	*China Energy Statistical Yearbook, 2010*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use accurate and reliable local or national data where available.
Any comment:	Reasonable

Data / Parameter:	$EF_{CO2,i,y}$
Data 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 used:	*IPCC 2006 Revised Guidelines*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use IPCC default value.

actually applied :	
Any comment:	Reasonable

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

Data / Parameter:	$OXID_{i,y}$
Data unit:	%
Description:	Oxidation factor of the fuel *i* in year *y*
Source of data used:	*IPCC 2006 Revised Guidelines*
Value applied:	Values depend on specifically fuel, referring to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the "*Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1) requirement, use IPCC default value.
Any comment:	Reasonable

Data / Parameter:	**Internal use rate of power plant**
Data unit:	%
Description:	The internal power consumption of power plants in year(s) *y*
Source of data used:	*China Electric Power Yearbook 2008-2010*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2008-2010*

Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	MCF_l
Data unit:	-
Description:	Annual methane conversion factor for the project manure storage device *l*
Source of data used:	Table 10.17, Chapter 10, Volume 4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See individual CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS III.D., IPCC default value should be used.
Any comment:	-

Data / Parameter:	$\eta_{BL,thermal}$
Data unit:	-
Description:	Efficiency of the baseline equipment being replaced by biogas boiler
Source of data used:	AMS-I.C.
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	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 in the PoA.
Any comment:	The most conservative way.

Data / Parameter:	η_{BL}
Data unit:	-
Description:	Efficiency of the baseline equipment being replaced by biogas stove
Source of data used:	AMS-I.C.
Value applied:	100%

Justification of the choice of data or description of measurement methods and procedures actually applied :	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 in the PoA.
Any comment:	The most conservative way.

Data / Parameter:	η_{PJ}
Data unit:	-
Description:	Efficiency of the biogas stove.
Source of data used:	National Standards of China
Value applied:	55%
Justification of the choice of data or description of measurement methods and procedures actually applied :	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 (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.
Any comment:	conservative

Data / Parameter:	$\eta_{flare,h}$
Data unit:	-
Description:	Flare efficiency of biogas flaring in the year y.
Source of data used:	-
Value applied:	0%
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is conservative.
Any comment:	-

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2/km
Description:	CO_2 emission factor from fuel use due to transportation
Source of data used:	Since there is no such parameter in IPCC 2006 Guidelines, thus the value in

	IPCC 1996 is applied
Value applied:	0.001011
Justification of the choice of data or description of measurement methods and procedures actually applied :	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
Any comment:	Only applied for the CPAs in which the material transportation is involved

Data / Parameter:	***FE***
Data unit:	-
Description:	Combustion efficiency of biogas utilized for energy generation in the year y.
Source of data used:	AMS-III.D.
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AMS-III.D., when the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy.
Any comment:	-

Data / Parameter:	***k***
Data unit:	-
Description:	Degradation rate constant
Source of data used:	AMS III.D.
Value applied:	0.069
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Methodology AMS III.D., IPCC default value should be used.
Any comment:	-

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

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

(Copy this table for each data and parameter)

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

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Farm owners will measure weight of livestock alive with mass scale and calculate the average in a project year.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	nd_y
Data unit:	day
Description:	Number of days in year "y" where the treatment plant was operational.
Source of data to be used:	Assumed 365 days in a typical SSC-CPA, actual data is from the measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	365
Description of measurement methods and procedures to be applied:	The data is obtained from the operation records of the treatment plant.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$N_{da,y}$
Data unit:	-
Description:	Number of days animal is alive in the farm in the year *y*
Source of data to be used:	The data used in a typical SSC-CPA comes from the farm owners, the actual data should be monitored monthly.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Record feed days
QA/QC procedures to be applied:	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
Any comment:	-

Data / Parameter:	$N_{p,y}$
Data unit:	-
Description:	Number of animals produced annually of type *LT* for the year *y*
Source of data to be used:	The data used in a typical SSC-CPA comes from the farm owners, the actual data should be monitored monthly.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Annually, based on monthly records.
QA/QC procedures to be applied:	The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed.
Any comment:	-

Data / Parameter:	$MS\%_{PJ,j}$
Data unit:	%
Description:	Fraction of manure handled in CPA animal manure management system "j"
Source of data to be used:	The farm owners, all manure handled in CPA animal manure management.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	Monitored annually. Archive electronically during project plus 2 years.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EG_{PJ,y}$
Data unit:	TJ/yr
Description:	The net quantity of thermal energy supplied by a CPA during the year y
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods	The temperature, pressure and flow of steam provided by the CPA, will be

and procedures to be applied:	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.
QA/QC procedures to be applied:	The three meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	-

Data / Parameter:	$B_{biomass-1,PJ,y}$
Data unit:	m^3
Description:	The net quantity of the biogas consumed by households in year *y*
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Measured continuously by one flow meters installed at the inlet of gas line network.
QA/QC procedures to be applied:	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	-

Data / Parameter:	$B_{biomass-2,PJ,y}$
Data unit:	m^3
Description:	The net quantity of the biogas supplied to boilers in year *y*
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Measured continuously by one flow meter installed at the inlet of the boiler.
QA/QC procedures to be applied:	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	-

Data / Parameter:	$B_{biomass-3,PJ,y}$
Data unit:	m^3
Description:	The net quantity of the biogas supplied to power generator in year *y*

Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Measured continuously by one flow meter installed at the inlet of the generator.
QA/QC procedures to be applied:	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	-

Data / Parameter:	$FV_{RG,h}$
Data unit:	m^3/h
Description:	Volumetric flow rate of biogas in dry basis at normal conditions in hour h;(m^3/h)
Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	NA
Description of measurement methods and procedures to be applied:	Measured continuously by one flow meter installed at the inlet of flaring system.
QA/QC procedures to be applied:	Flow meters will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	Only applied for the CPAs in which the flaring is involved

Data / Parameter:	Q_y
Data unit:	ton
Description:	Quantity of manure transported
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	On-site data sheets recorded monthly using weigh bridge.
QA/QC procedures to	Weighbridge will be subject to periodic calibration (in accordance with

be applied:	stipulation of the weighbridge supplier), also cross check with sales of compost
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	$Q_{y,treatment}$
Data unit:	ton
Description:	Quantity of product transported
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	On-site data sheets recorded monthly using weigh bridge.
QA/QC procedures to be applied:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier), also cross check with sales of compost
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	CT_y
Data unit:	ton/truck
Description:	Average truck capacity for manure transportation
Source of data to be used:	FSR and the information provided by the farm
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	On site measurement
QA/QC procedures to be applied:	-
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	$CT_{y,treatment}$
Data unit:	ton/truck
Description:	Average truck capacity for product transportation
Source of data to be used:	FSR and the information provided by the farm

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	On site measurement
QA/QC procedures to be applied:	-
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	DAF_w
Data unit:	km/truck
Description:	Average incremental distance for manure transportation
Source of data to be used:	FSR and the information provided by the farm owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Annually on site measurement, assumption to be approved by DOE
QA/QC procedures to be applied:	-
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	$DAF_{treatment}$
Data unit:	km/truck
Description:	Average incremental distance for product transportation
Source of data to be used:	FSR and the information provided by the farm owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Annually on site measurement, assumption to be approved by DOE
QA/QC procedures to	-

be applied:	
Any comment:	Applicable only if project emissions on account of transportation shall be accounted for.

Data / Parameter:	***T***
Data unit:	°C
Description:	Temperature of the biogas at the flow measurement site
Source of data to be used:	measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	NA
Description of measurement methods and procedures to be applied:	The temperature of the biogas will be recorded daily using thermometer and monthly averaged. Measured to determine the density of methane D_{CH4}.
QA/QC procedures to be applied:	Thermometer will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	No separate monitoring of temperature is necessary if using flow meters that automatically measure the temperature and pressure of biogas, and expressing biogas volumes in normalized cubic meters.

Data / Parameter:	***P***
Data unit:	Pa
Description:	Pressure of the biogas at the flow measurement site
Source of data to be used:	measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	NA
Description of measurement methods and procedures to be applied:	The pressure of the biogas will be recorded daily using manometer and monthly averaged. Measured to determine the density of methane D_{CH4}.
QA/QC procedures to be applied:	The manometer will undergo maintenance/calibration subject to appropriate industry standards.
Any comment:	No separate monitoring of pressure is necessary if using flow meters that automatically measure the temperature and pressure of biogas, and expressing biogas volumes in normalized cubic meters.

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity supplied to and/or displaced from the grid as a result of the implementation of the CDM project activity in year *y*

Source of data to be used:	The data used in a CPA comes from FSR, the actual data should be measured with electricity meter.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Electricity meters should be installed to measure the quantity of the electricity consumed by a typical SSC-CPA in year y.
QA/QC procedures to be applied:	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
Any comment:	-

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity consumed by a typical SSC-CPA in year *y*
Source of data to be used:	The data used in a CPA comes from FSR, the actual data should be measured with electricity meter.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Electricity meters should be installed to measure the quantity of the electricity consumed by a typical SSC-CPA in year y.
QA/QC procedures to be applied:	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. Uncertainty of the meters to be obtained from the manufacturers.
Any comment:	-

Data / Parameter:	$MS\%_{l}$
Data unit:	-
Description:	Fraction of volatile solids (%) handled by storage device *l*
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of	Monitored annually. Archive electronically during project plus 2 years.

measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	-
Any comment:	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.

Data / Parameter:	AI_l
Data unit:	days
Description:	Annual average interval between manure collection and delivery for treatment at a given storage device *l*
Source of data to be used:	FSR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Monitored by daily operation record.
QA/QC procedures to be applied:	-
Any comment:	Applicable only if project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for.

Data / Parameter:	T_i
Data unit:	°C
Description:	Annual Average ambient temperature at weather station nearby project site.
Source of data to be used:	weather station nearby project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see individual CPA-DD
Description of measurement methods and procedures to be applied:	Monitoring frequency will be monthly. Archive electronically during the crediting period plus 2 years.
QA/QC procedures to be applied:	-
Any comment:	Used to select the annual MCF from 2006 IPCC Guidelines

Data / Parameter:	**On-site inspections**
Data unit:	-

Description:	On-site inspections for each individual farm included in the project boundary where the project activity is implemented for each verification period.
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	On-site inspections for each individual farm included in the project boundary will be conducted by the person in charge of CPA.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**-**
Data unit:	Continuous operation of the household biogas stoves
Description:	FSR, and the actual information should be assessed
Source of data to be used:	Please see individual CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance.
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	Continuous operation of the household biogas stoves
Any comment:	-

Data / Parameter:	**Soil application**
Data unit:	-
Description:	The proper soil application (not resulting in methane emissions) of the residual waste
Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods	Monitor the soil application when the final sludge be used and clarify the soil application is proper.

and procedures to be applied:	
QA/QC procedures to be applied:	-
Any comment:	Where applicable, the proper soil application (not resulting in methane emissions) of the residual waste shall be monitored.

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

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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.

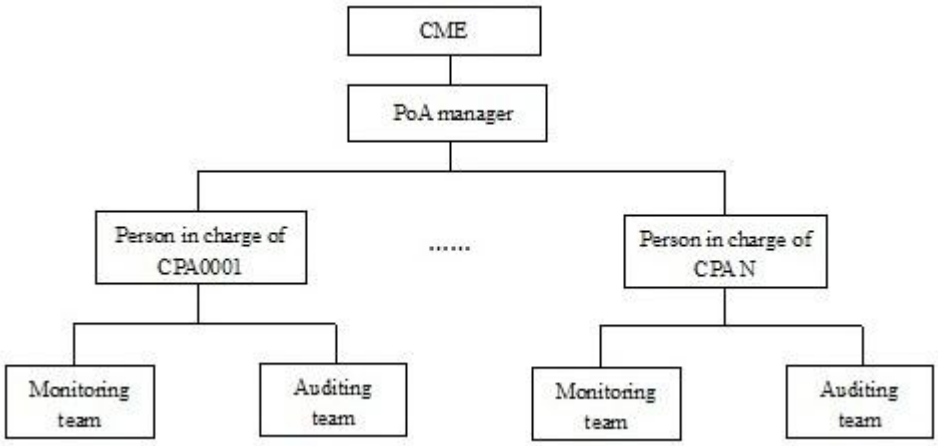


Figure 6. Monitoring Structure

Position	Responsibility description
PoA manager	PoA manager is designated by CME and is in full charge of monitoring and other 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.
Person in charge of CPA	Take in charge of all monitoring matters related to this CPA, including monitoring team and auditing team management, and training implementation for monitoring team and auditing team.
Monitoring team	Take in charge of monitoring implementation and the data collection according to the Monitoring Manual.
Auditing team	Audit the work regarding monitoring and conduct the QC/QA procedures as per the Monitoring Manual.

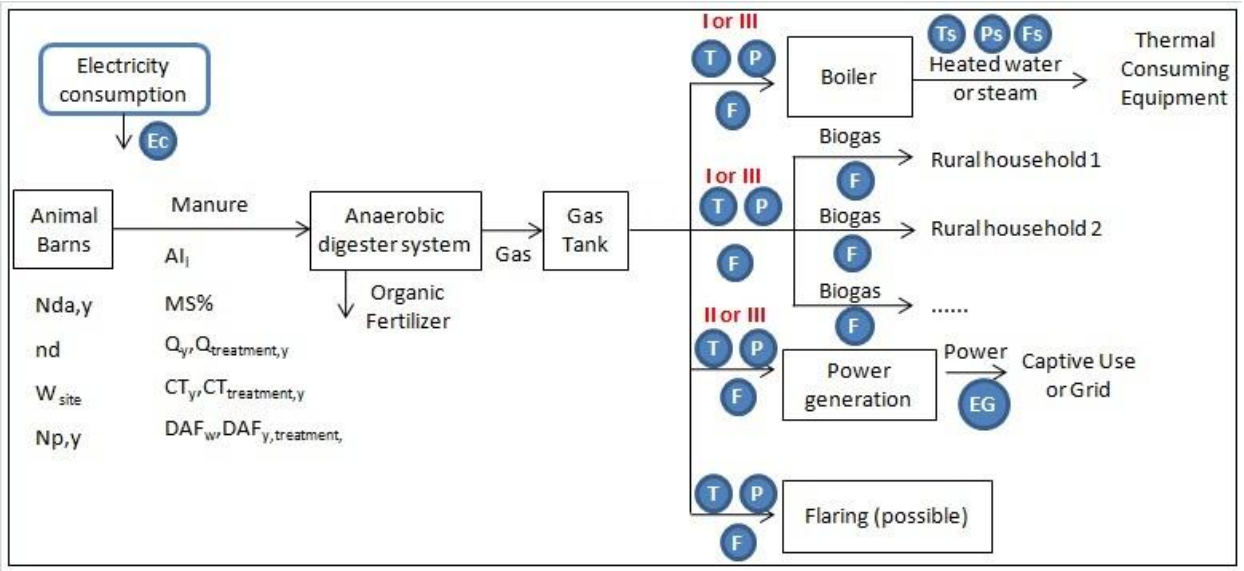
All data will be bottom-up collected and reported as shown in monitoring structure and finally reported to CME.

Monitoring Parameter

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

Installation of Monitoring Meters

Location of each meter can be shown in the following figure:



Note: "I or III" means this branch in the technology flow will only appear in the case of **Scenario I** or **III;**
"II or III" means this branch in the technology flow will only appear in the case of **Scenario II** or **III;**

Figure 7. Monitoring system

Data Collection and Management

Monitoring team will implement monitoring and collect the monitoring data according to the Monitoring Manual. All data will be bottom-up collected as per the monitoring structure and the regular summary should be made and reported to CME periodically. All data will be transmitted to the monitoring computer managed by CME. All the data after internal validation should be saved up to 2 years after the end of the crediting period.

Measuring instrument fault/emergency treatment procedures

Once a meter is in fault, it shall be replaced immediately with another calibrated meter 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.

QA/QC

In order to maintain high precision for meters, the calibration should be implemented according to state and/or sector standards and rules and certificated after calibration.

The meters should be calibrated periodically. Within 10 days on the date of:

(1) The error of duty meters occurs and checking meters oversteps the permissible range;

(2) Repairs due to meters failure.

Training

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

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.

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

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The application of the baseline study and monitoring methodology of the PoA was completed on 25/10/2011 by:

Contact Information of the responsible person	**Is organisation a Project Participant *Yes/No***
Juchuan BAI Yanan LIU Jing HUANG A&T Carbon Asset Co., Limited Room 1806 Tower A, Wanda Plaza, Choyang District, Beijing, P.R. China Postcode:100022 Tel: +86 10 65830366 Fax: +86 10 65833191 Email: Juchuan. bai@atholdings.com Melody.liu@atholdings.com Catherine.huang@atholdings.com Website: www.atholdings.com	Yes

Annex 1

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

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for this Project.

Annex 3

BASELINE INFORMATION

Section A

The emission factors of OM and BM for the Central China Power Grid are calculated based on the approved Tool *"Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1). The information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Fuel-fired power generation of the Central China Power Grid in 2007

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Jiangxi	42,100,000	7.72	38,849,880
Henan	177,300,000	7.55	163,913,850
Hubei	60,900,000	6.69	56,825,790
Hunan	54,200,000	7.18	50,308,440
Chongqing	28,800,000	9.2	26,150,400
Sichuan	45,100,000	8.68	41,185,320
Total			377,233,680

Data source: China Electric Power Yearbook 2008.

Table A2. Fuel-fired power generation of the Central China Power Grid in 2008

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Jiangxi	40,500,000	6.5	37,867,500
Henan	189,000,000	7.22	175,354,200
Hubei	55,300,000	6.62	51,639,140
Hunan	53,700,000	6.46	50,230,980
Chongqing	28,600,000		28,600,000
Sichuan	40,100,000	10.21	36,005,790
Total			379,697,610

Data source: China Electric Power Yearbook 2009.

Table A3. Fuel-fired power generation of the Central China Power Grid in 2009

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Jiangxi	44,500,000	5.8	41,919,000
Henan	198,500,000	6.62	185,359,300
Hubei	63,000,000	6.21	59,087,700
Hunan	63,400,000	6.39	59,348,740
Chongqing	30,600,000		30,600,000
Sichuan	50,400,000	7.92	46,408,320
Total			422,723,060

Data source: China Electric Power Yearbook 2010

Table A4. Calculation of simple OM emission factor of the Central China Power Grid in 2007

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission Factor (tC/TJ) H	Oxidation Rate (%) I	Emission Factor ($kgCO_2/TJ$) J	NCV (MJ/t or $1000m^3$) K	Emission (tCO_2e) L[6]
Coal	10^4t	2200.57	9357	3479.81	2683.81	1547.7	3239	**22507.89**	25.8	100	87,300	20,908	410,829,404
Cleaned coal	10^4t		3.07			3.8		**6.87**	25.8	100	87,300	26,344	157,998
Other washed coal	10^4t	0.04	87.16		2.06	96.42		**185.68**	25.8	100	87,300	8,363	1,355,631
Briquette	10^4t						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke	10^4t							**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.08	2.61	0.25	0.31	0.91		**4.16**	12.1	100	37,300	16,726	259,534
Other gas	10^8m^3	29.17	25.79		24.69		23.98	**103.63**	12.1	100	37,300	5,227	2,020,444
Crude oil	10^4t		0.43					**0.43**	20	100	71,100	41,816	12,784
Gasoline	10^4t				0.04	0.01		**0.05**	18.9	100	67,500	43,070	1,454
Diesel	10^4t	0.98	3.21	2.51	2.83	1.93		**11.46**	20.2	100	72,600	42,652	354,863
Fuel oil	10^4t	0.42	1.25	1.33	0.63	0.64	1.74	**6.01**	21.1	100	75,500	41,816	189,742
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	1.43	10.01	0.97	0.7			**13.11**	15.7	100	48,200	46,055	291,022
Nature gas	10^8m^3		0.12	0.18		0.2	1.87	**2.37**	15.3	100	54,300	38,931	501,007
Other Petroleum Products	10^4t							**0**	20	100	75,500	41,816	0
Other Coking Products	10^4t							**0**	25.8	100	95,700	28,435	0
Other energy	10^4tCe	23.43	63.65	35.95	29.46	23.21		**175.7**	0	0	0	0	0
Total emission of the Central China Grid (tCO_2e) L								415,974,066					
Fossil power supply of the Central China Grid (MWh) M								377,233,680					
Imported electricity from the Northwest China Grid (MWh) N								3,005,400					
Emission factor of Northwest China Grid(tCO_2e/MWh) O								1.01129					
Total emission (tCO_2e) P=L+O*N								419,013,395					
Total electricity delivered to the grid (MWh) Q= M+N								380,239,080					

Data sources: China Energy Statistical Yearbook 2008

[6] L=G*J*K/100000 (mass unit) or L= G*J*K/10000 (volume unit)

Table A5. Calculation of simple OM emission factor of the Central China Power Grid in 2008

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission factor (tC/TJ) H	Oxidation rate (%) I	Emission factor ($kgCO_2/TJ$) J	NCV (MJ/t or $1000m^3$) K	Emission (tCO_2e) L
Coal	10^4t	2137.08	9480.74	2852.29	2620.44	1421.42	2727.61	**21239.58**	25.8	100	87,300	20,908	387,679,342
Cleaned coal	10^4t		1.68			3.27		**4.95**	25.8	100	87,300	26,344	113,842
Other washed coal	10^4t	0.04	80.54		2.06	101.75		**184.39**	25.8	100	87,300	8,363	1,346,213
Briquette	10^4t				6.12		0.01	**6.13**	26.6	100	87,300	20,908	
Coke	10^4t		0.78		0.92			**1.7**	29.2	100	95,700	28,435	111,889
Coke oven gas	10^8m^3	0.1	4.19	0.37	0.24	6.66	0.01	**11.57**	12.1	100	37,300	16,726	46,261
Other gas	10^8m^3	23.67	41.36		3.31	0.37	0.01	**68.72**	12.1	100	37,300	5,227	721,829
Crude oil	10^4t		0.17					**0.17**	20	100	71,100	41,816	1,339,814
Gasoline	10^4t							**0**	18.9	100	67,500	43,070	5,054
Diesel	10^4t	0.88	7.02	2.82	3.41	1.59		**15.72**	20.2	100	72,600	42,652	0
Fuel oil	10^4t	0.07	1.45		1.29		3.14	**5.95**	21.1	100	75,500	41,816	486,775
LPG	10^4t							**0**	17.2	100	61,600	50,179	187,848
Refinery gas	10^4t	0.21	3.91	2.78	0.71		0.01	**7.62**	15.7	100	48,200	46,055	0
Nature gas	10^8m^3		4.02	0.16		0.05	12.92	**17.15**	15.3	100	54,300	38,931	169,153
Other Petroleum Products	10^4t			0.59				**0.59**	20	100	72,200	41,816	3,625,430
Other Coking Products	10^4t						0.01	**0.01**	25.8	100	95,700	28,435	17,813
Other energy	10^4tCe	18.16	68.11	62.35	11.42	64.87		**0.01**	25.8	100	95,700	28,435	272
Total emission of the Central China Grid (tCO_2e) L							395,851,534						
Fossil power supply of the Central China Grid (MWh) M							379,697,610						
Imported electricity from the Northwest China Grid (MWh) N							3,144,070						

Emission factor of Northwest China Grid(tCO_2e/MWh) O		0.98254
Imported electricity from the Northern China Grid (MWh) P		33,200
Emission factor of Northern China Grid(tCO_2e/MWh) Q		1.00495
Total emission (tCO_2e) R=L+O*N+P*Q		398,974,078
Total electricity delivered to the grid (MWh) S= M+N+P		382,874,880

Data sources: China Energy Statistical Yearbook 2009

Table A6. Calculation of simple OM emission factor of the Central China Power Grid in 2009

Energy	**Unit**	**Jiangxi A**	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total Fuel G=A+B+…+F**	**Emission Factor (tC/TJ) H**	**Oxidation Rate (%) I**	**Emission Factor ($kgCO_2$/TJ) J**	**NCV (MJ/t or 1000m^3) K**	**Emission (tCO_2e) L**
Coal	10^4t	2184.31	9339.64	2888.29	2810.69	1413.64	2817.31	21453.88	391,590,892	2184.31	9339.64	2888.29	2810.69
Cleaned coal	10^4t		3.35					3.35	77,044		3.35		
Other washed coal	10^4t		59.93			136.75	97.94	294.62	2,150,991		59.93		
Briquette	10^4t				2.63			2.63	48,005				2.63
Coke	10^4t		1.08	0.06	0.09			1.23	33,471		1.08	0.06	0.09
Coke oven gas	10^8m^3	0.09	6.04	1.2		1.03		8.36	521,564	0.09	6.04	1.2	
Other gas	10^8m^3	30.76	56.64		4.23	7.57		99.2	1,934,074	30.76	56.64		4.23
Crude oil	10^4t		0.1					0.1	2,973		0.1		
Gasoline	10^4t							0	0				
Diesel	10^4t	0.69	4.28	1.23	1.55	1.19		8.94	276,830	0.69	4.28	1.23	1.55
Fuel oil	10^4t	0.02	1.44	0.48	1.27	0.06	4	7.27	229,522	0.02	1.44	0.48	1.27
LPG	10^4t							0	0				
Refinery gas	10^4t	0.25	2.18	0.82	1.91			5.16	114,544	0.25	2.18	0.82	1.91
Nature gas	10^8m^3		7.69	0.27		0.14	21.84	29.94	6,329,176		7.69	0.27	
Other Petroleum Products	10^4t			0.29				0.29	8,755			0.29	
Other Coking Products	10^4t							0	0				
Other energy	10^4tCe	12.47	76.3	26.69	14.96	84.8		215.22	0	12.47	76.3	26.69	14.96
Total emission of the Central China Grid (tCO_2e) L							403,317,841						
Fossil power supply of the Central China Grid (MWh) M							422,723,060						

Imported electricity from the Northwest China Grid (MWh) N		3,262,010
Emission factor of Northwest China Grid(tCO_2e/MWh) O		1.00759
Imported electricity from the North China Grid (MWh) P		2,233,290
Emission factor of North China Grid(tCO_2e/MWh) Q		0.96418
Total emission (tCO_2e) R=L+O*N+P*Q		408,757,899
Total electricity delivered to the grid (MWh) S= M+N+P		428,218,360

Data sources: China Energy Statistical Yearbook 2010

$EF_{OM,y}=(P_{2007}+R_{2008} +R_{2009}) / (Q_{2007}+S_{2008} +S_{2009}) = 1.02973\ tCO_2e/MWh$

Table A7. Data and result of Step (1) for simple BM emission factor

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Subtotal	**NCV (MJ/t or 1000m^3)**	**Emission factor (tC/TJ)**	**Oxidation Rate**	CO_2 Emission（tCO_2e）
		A	**B**	**C**	**D**	**E**	**F**	**G=A+…+F**	**H**	**I**	**J**	**K=G*H*I*J/100000**
Raw Coal	10^4 t	2,184.31	9,339.64	2,888.29	2,810.69	1,413.64	2,817.31	21,453.88	20,908	87,300	1	391,590,892
Cleaned Coal	10^4 t	0.00	3.35	0.00	0.00	0.00	0.00	3.35	26,344	87,300	1	77,044
Other Washed Coal	10^4 t	0.00	59.93	0.00	0.00	136.75	97.94	294.62	8,363	87,300	1	2,150,991
Briquettes	10^4 t	0.00	0.00	0.00	2.63	0.00	0.00	2.63	20,908	87,300	1	48,005
Coke	10^4 t	0.00	1.08	0.06	0.09	0.00	0.00	1.23	28,435	95,700	1	33,471
Other Coking Products	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28,435	95,700	1	0
Subtotal												**393,900,403**
Crude Oil	10^4 t	0.00	0.10	0.00	0.00	0.00	0.00	0.10	41,816	71,100	1	2,973
Gasoline	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43,070	67,500	1	0
Diesel Oil	10^4 t	0.69	4.28	1.23	1.55	1.19	0.00	8.94	42,652	72,600	1	276,830
Fuel Oil	10^4 t	0.02	1.44	0.48	1.27	0.06	4.00	7.27	41,816	75,500	1	229,522
Other Petroleum Products	10^4 t	0.00	0.00	0.29	0.00	0.00	0.00	0.29	41,816	72,200	1	8,755
Subtotal												**518,081**
Natural Gas	10^7m^3	0.00	76.90	2.70	0.00	1.40	218.40	299.40	38,931	54,300	1	6,329,176
Coke Oven Gas	10^7m^3	0.90	60.40	12.00	0.00	10.30	0.00	83.60	16,726	37,300	1	521,564
Other Gas	10^7m^3	307.60	566.40	0.00	42.30	75.70	0.00	992.00	5,227	37,300	1	1,934,074
LPG	10^4 t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,179	61,600	1	0
Refinery Gas	10^4 t	0.25	2.18	0.82	1.91	0.00	0.00	5.16	46,055	48,200	1	114,544
Subtotal												**8,899,358**
Total												**403,317,841**

Data sources: China Energy Statistical Yearbook 2010.

Calculate with data provided in Table A7 and formula (4)~(6), the value for $\lambda_{Coal,y}$ =97.66%，$\lambda_{Oil,y}$ =0.13%，$\lambda_{Gas,y}$ =2.21%

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

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.7871 tCO_2e/MWh$$

Table A9. Installed capacity of the Central China Power Grid in 2009

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	11,500	43,100	15,670	15,900	6,800	12,270	105,240
Hydro power (MW)	3,770	3,650	30,010	11,460	4,530	25,810	79,230
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	60	50	10	2	10	0	132
Total (MW)	15,330	46,800	45,690	27,362	11,340	38,080	184,602

Data source: China Electric Power Yearbook 2010

Table A10. Installed capacity of the Central China Power Grid in 2008

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	9,340	42,680	14,210	14,430	6,660	12,770	100,090
Hydro power (MW)	3,710	3,020	29,050	10,650	4,060	22,240	72,730
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	30	30	10	0	0	0	70
Total (MW)	13,080	45,720	43,280	25,080	10,730	35,010	172,890

Data source: China Electric Power Yearbook 2009

Table A11. Installed capacity of the Central China Power Grid in 2007

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	9,270	38,540	13,040	13,360	6,370	12,000	92,580
Hydro power (MW)	3,570	2,740	24,020	9,220	2,240	19,860	61,650
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	10	17	24	0	51
Total (MW)	12,840	41,280	37,070	22,597	8,634	31,860	154,281

Data source: China Electric Power Yearbook 2008

Table A12. Calculation of BM emission factor of the Central China 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	92,580	100,090	105,240	20,280	10,468	53.25%
Hydro power	61,650	72,730	79,230	17,727	6,500	46.54%
Nuclear power	0	0	0	0	0	0.00%
Wind power and other	51	70	132	81	62	0.21%
Total	**154,281**	**172,890**	**184,602**	**38,088**	**17,030**	**100.00%**
Share in total installed capacity of 2009				20.63%	9.23%	

Note: 1 and 2 are the results of new additions with considering installed capacities, shutdown capacities and installed capacities of pumped storage.

$EF_{BM,y}$ =**0.7871 × 53.25% = 0.4191** 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 × 1.0297+ 0.5 × 0.4191= **0.7244 (tCO_2e/MWh)**

Section B

The emission factors of OM and BM for the Northwest Power Grid are calculated based on the approved Tool *"Tool to calculate the emission factor for an electricity system"* (Ver. 02.2.1).The information provided by the tables includes data, data sources and the underlying calculations.

Table B1. Fuel-fired power generation of the China Northwest Power Grid in 2007

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	59,100,000	6.77	55,098,930
Gansu	42,400,000	5.89	39,902,640
Qinghai	9,700,000	7.19	9,002,570
Ningxia	43,500,000		43,500,000
Xinjiang	34,600,000	9.2	31,416,800
Total			178,920,940

Data source: China Electric Power Yearbook 2008.

Table B2. Fuel-fired power generation of the China Northwest Power Grid in 2008

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	71,500,000	6.95	66,530,750
Gansu	46,800,000	6.4	43,804,800
Qinghai	10,700,000	7.14	9,936,020
Ningxia	44,000,000	7.57	40,669,200
Xinjiang	39,700,000		39,700,000
Total			200,640,770

Data source: China Electric Power Yearbook 2009.

Table B3. Fuel-fired power generation of the China Northwest Power Grid in 2009

Province name	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	77,400,000	7.24	71,796,240
Gansu	44,100,000	6.88	41,065,920
Qinghai	10,700,000	7.01	9,949,930
Ningxia	44,700,000	7.76	41,231,280
Xinjiang	45,200,000	5.16	42,867,680
Total	222,100,000		206,911,050

Data source: China Electric Power Yearbook 2010

Table B4. Calculation of simple OM emission factor of the China Northwest Power Grid in 2007

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total Fuel F=A+B+…+E	Emission factor (tC/TJ) G	Oxidation rate (%) H	Emission factor ($kgCO_2/TJ$) I	NCV (MJ/t or $1000m^3$) J	Emission (tCO_2e) K[7]
Coal	10^4t	3303.44	1969.03	470.85	2165.8	1762.11	**9671.23**	25.8	100	87,300	20,908	176,525,905
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	3.73			124.31	7.73	**135.77**	25.8	100	87,300	8,363	991,243
Briquette	10^4t	3.53					**3.53**	26.6	100	87,300	20,908	64,432
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.52	0.65			0.26	**1.43**	12.1	100	37,300	16,726	89,215
Other gas	10^8m^3	14.14	0.71				**14.85**	12.1	100	37,300	5,227	289,526
Crude oil	10^4t					0.09	**0.09**	20	100	71,100	41,816	2,676
Gasoline	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Diesel	10^4t	1.12	0.26	0.42		1.77	**3.57**	20.2	100	72,600	42,652	110,546
Fuel oil	10^4t	0.01	1.05	0.04		0.05	**1.15**	21.1	100	75,500	41,816	36,307
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t					5.99	**5.99**	15.7	100	48,200	46,055	132,969
Nature gas	10^8m^3	1.68	0.49	1.93		8.66	**12.76**	15.3	100	54,300	38,931	2,697,404
Other Petroleum Products	10^4t						**0**	20	100	75,500	41,816	0
Other Coking Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other energy	10^4tCe	94.36	9.73				**104.09**	0	0	0	0	0
Total emission of the China Northwest Grid (tCO_2e) L							**180,940,805**					

[7] K=F*H*I*J/100000 (mass unit) or K=F*H*I*J/10000 (volume unit)

Fossil power supply of the China Northwest Grid (MWh) M		**178,920,940**

Data sources: China Energy Statistical Yearbook 2008

Table B5. Calculation of simple OM emission factor of the China Northwest Power Grid in 2008

Energy	**Unit**	**Shaanxi** **A**	**Gansu** **B**	**Qinghai** **C**	**Ningxia** **D**	**Xinjiang** **E**	**Total Fuel** **F=A+B+…+E**	**Emission factor (tC/TJ)** **G**	**Oxidation rate (%)** **H**	**Emission factor ($kgCO_2/TJ$)** **I**	**NCV (MJ/t or $1000m^3$)** **J**	**Emission (tCO_2e)** **K**
Coal	10^4t	3620	2216.9	507.44	2330.72	1924.9	**10599.96**	25.8	100	87,300	20,908	193,477,720
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	9.22			53.85	8.2	**71.27**	25.8	100	87,300	8,363	520,335
Coke	10^4t						**0**	26.6	100	87,300	20,908	0
Coke oven gas	10^8m^3						**0**	29.2	100	95,700	28,435	0
Other gas	10^8m^3	0.35	0.74			0.13	**1.22**	12.1	100	37,300	16,726	76,113
Crude oil	10^4t	18.38	0.2				**18.58**	12.1	100	37,300	5,227	362,249
Gasoline	10^4t						**0**	20	100	71,100	41,816	0
Diesel	10^4t	0.05				0.01	**0.06**	18.9	100	67,500	43,070	1,744
Fuel oil	10^4t	1.03	0.44	0.26	0.05	1.64	**3.42**	20.2	100	72,600	42,652	105,902
LPG	10^4t		0.86	0.04		0.02	**0.92**	21.1	100	75,500	41,816	29,045
Refinery gas	10^4t						**0**	17.2	100	61,600	50,179	0
Nature gas	10^8m^3					7.25	**7.25**	15.7	100	48,200	46,055	160,939
Other Petroleum Products	10^4t	0.94	0.24	2.99		7.2	**11.37**	15.3	100	54,300	38,931	2,403,565
Other Coking Products	10^4t					0.01	**0.01**	20	100	72,200	41,816	302
Other energy	10^4tCe						**0**	25.8	100	95,700	28,435	0
Total emission of the China Northwest Grid (tCO_2e) L							197,137,915					
Fossil power supply of the China Northwest Grid (MWh) M							200,640,770					

Data sources: China Energy Statistical Yearbook 2009

Table B6. Calculation of simple OM emission factor of the China Northwest Power Grid in 2009

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total Fuel F=A+B+…+E	Emission factor (tC/TJ) G	Oxidation rate (%) H	Emission factor ($kgCO_2/TJ$) I	NCV (MJ/t or $1000m^3$) J	Emission (tCO_2e) K
Coal	10^4t	3949.22	2060	467.05	2350.13	2380	**11206.4**	25.8	100	87,300	20,908	204,546,878
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	8.34			56.01	6.66	**71.01**	25.8	100	87,300	8,363	518,437
Coke	10^4t						**0**	26.6	100	87,300	20,908	0
Coke oven gas	10^8m^3						**0**	29.2	100	95,700	28,435	0
Other gas	10^8m^3	0.49	0.8			0.12	**1.41**	12.1	100	37,300	16,726	87,967
Crude oil	10^4t	18.37	0.44				**18.81**	12.1	100	37,300	5,227	366,733
Gasoline	10^4t						**0**	20	100	71,100	41,816	0
Diesel	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Fuel oil	10^4t	0.6	0.52	0.2	0.07	0.7	**2.09**	20.2	100	72,600	42,652	64,718
LPG	10^4t		0.25	0.08		0.06	**0.39**	21.1	100	75,500	41,816	12,313
Refinery gas	10^4t	0.02					**0.02**	17.2	100	61,600	50,179	618
Nature gas	10^8m^3					8.56	**8.56**	15.7	100	48,200	46,055	190,019
Other Petroleum Products	10^4t	0.91	0.07	3.93		7.83	**12.74**	15.3	100	54,300	38,931	2,693,177
Other Coking Products	10^4t						**0**	20	100	72,200	41,816	0
Other energy	10^4tCe						**0**	25.8	100	95,700	28,435	0
Total emission of the China Northwest Grid (tCO_2e) L							208,481,441					
Fossil power supply of the China Northwest Grid (MWh) M							206,911,050					

Data sources: China Energy Statistical Yearbook 2010

$EF_{OM,y}$=(L_{2007}+L_{2008} +L_{2009}) / (M_{2007}+M_{2008}+ M_{2009}) = 1.0001 tCO_2e/MWh

Table B7. Data and result of Step (1) for simple BM emission factor

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total Fuel G=A+B+…+E	NCV (MJ/t or 1000m^3) H	Emission factor (tC/TJ) I	Oxidation Rate J	Emission (tCO_2e) K=G*H*I*J /100,000
Raw coal	10^4t	3,949.22	2,060	467.05	2,350.13	2,380	11,206.4	20,908	87,300	1	204,546,513
Cleaned coal	10^4t	0	0	0	0	0	0	26,344	87,300	1	0
Other washed coal	10^4t	8.34	0	0	56.01	6.66	71.01	8,363	87,300	1	518,437
Briquette	10^4t	0	0	0	0	0	0	20,908	87,300	1	0
Coke	10^4t	0	0	0	0	0	0	28,435	95,700	1	0
Other coke products	10^4t	0	0	0	0	0	0	28,435	95,700	1	0
Sub-total											
Crude oil	10^4t	0	0	0	0	0	0	41,816	71,100	1	0
Gasoline	10^4t	0.02	0	0	0	0	0.02	43,070	67,500	1	581
Diesel	10^4t	0.6	0.52	0.2	0.07	0.7	2.09	42,652	72,600	1	64,718
Fuel oil	10^4t	0	0.25	0.08	0	0.06	0.39	41,816	75,500	1	12,313
Other petroleum products	10^4t	0	0	0	0	0	0	41,816	72,200	1	0
Sub-total											
Natural gas	10^7m^3	9.1	0.7	39.3	0	78.3	127.4	38,931	54,300	1	2,693,177
Coke oven gas	10^7m^3	4.9	8	0	0	1.2	14.1	16,726	37,300	1	87,967
Other gas	10^7m^3	183.7	4.4	0	0	0	188.1	5,227	37,300	1	366,733
PLG	10^4t	0.02	0	0	0	0	0.02	50,179	61,600	1	618

Refinery gas	10^4t	0	0	0	0	8.56	8.56	46,055	48,200	1	190,019
Sub-total											3,338,514
Total											208,481,076

Data sources: China Energy Statistical Yearbook 2010.

Calculate with data provided in Table B7 and formula (4)~(6), the value for $\lambda_{Coal,y}$=98.36%，$\lambda_{Oil,y}$=0.04%， $\lambda_{Gas,y}$=1.60%

Table B8. 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	$EF_{Coal,Adv}$	39.08%	87,300	1	0.8042
Gas-based power plants	$EF_{Gas,Adv}$	51.46%	75,500	1	0.5282
Oil-based power plants	$EF_{Oil,Adv}$	51.46%	54,300	1	0.3799

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} = 0.7975 tCO_2e/MWh$$

Table B9. Installed capacity of the China Northwest Power Grid in 2009

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	19,900	10,990	1,930	8,820	9,520	51,160
Hydro power (MW)	1,920	5,940	8,740	430	2,430	19,460
Nuclear power (MW)	0	0	0	0	0	0
Wind power and Other (MW)	0	750	0	270.3	860	1880.3
Total (MW)	21,820	17,680	10,670	9,520.3	12,810	72,500.3

Data source: China Electric Power Yearbook 2010

Table B10. Installed capacity of the China Northwest Power Grid in 2008

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	17,850	8,980	2,000	7,540	8,200	44,570
Hydro power (MW)	1,810	5,440	5,910	430	2,190	15,780
Nuclear power (MW)	0	0	0	0	0	0
Wind power and Other (MW)	0	600	0	170	510	1,280
Total (MW)	19,660	15,020	7,910	8,140	10,900	61,630

Data source: China Electric Power Yearbook 2009

Table B11. Installed capacity of the China Northwest Power Grid in 2007

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	12,290	7,840	1,900	7,030	6,560	35,620
Hydro power (MW)	1,790	4,400	5,830	430	2,140	14,590
Nuclear power (MW)	0	0	0	0	0	0
Wind power and Other (MW)	72.5	346	0	50	330	798.5
Total (MW)	14,152.5	12,586	7,730	7,510	9,030	51,008.5

Data source: China Electric Power Yearbook 2008

Table B12. Calculation of BM emission factor of the China Northwest 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 (MW) D	Capacity additions from 2008 to 2009 (MW) E	Share in total capacity additions
Thermal power	35,620	44,570	80,190	16,998	7,389	74.07%
Hydro power	14,590	15,780	30,370	4,870	3,680	21.22%
Nuclear power	0	0	0	0	0	0.00%
Wind power and other	798.5	1,280	2,078.5.3	1,081.8	600	4.71%
Total	**51,008.5**	**61,630**	**112,638.8.3**	**22,949.88**	**11,669**	**100.00%**
Share in total installed capacity of 2008				31.65%	16.10%	

Note: 1 and 2 are the results of new additions with considering installed capacities, shutdown capacities and installed capacities of pumped storage.

$EF_{BM,y}$ =0.7899×74.07%=0.5851 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 × 1.0001+ 0.5 × 0.5851= **0.7926 (tCO_2e/MWh)**

Annex 4

MONITORING INFORMATION

No additional information

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