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

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Title: Henan BCCY New Power Industry Co., Ltd. LFG recovery to power Programme of Activities
Version: 3.2
Issuance date: 24/12/2012

Version	*Date*	*Comments*
1.0	28/12/2011	First Issuance for GSC (as large scale POA)
2.0	18/04/2012	First Issuance for GSC (as small scale POA)
3.0	01/08/2012	Revised according to CAR&CL
3.1	27/08/2012	Changed the title of PoA to introduce CME as the part of the title[1]
3.2	24/12/2012	Minor changes for the submission for registration

A.2. Purpose and general description of the PoA

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In general, landfill Gas (LFG) capture and usage is a process capable of making use of the biogas spontaneously generated from the organic fraction of waste in landfills to produce electric power (or other forms of useful energy). Due to various barriers – the main one being insufficient financial return from such activity – such process is rarely applied in China. The overall result is that the huge potential of LFG use in China is not adequately exploited.

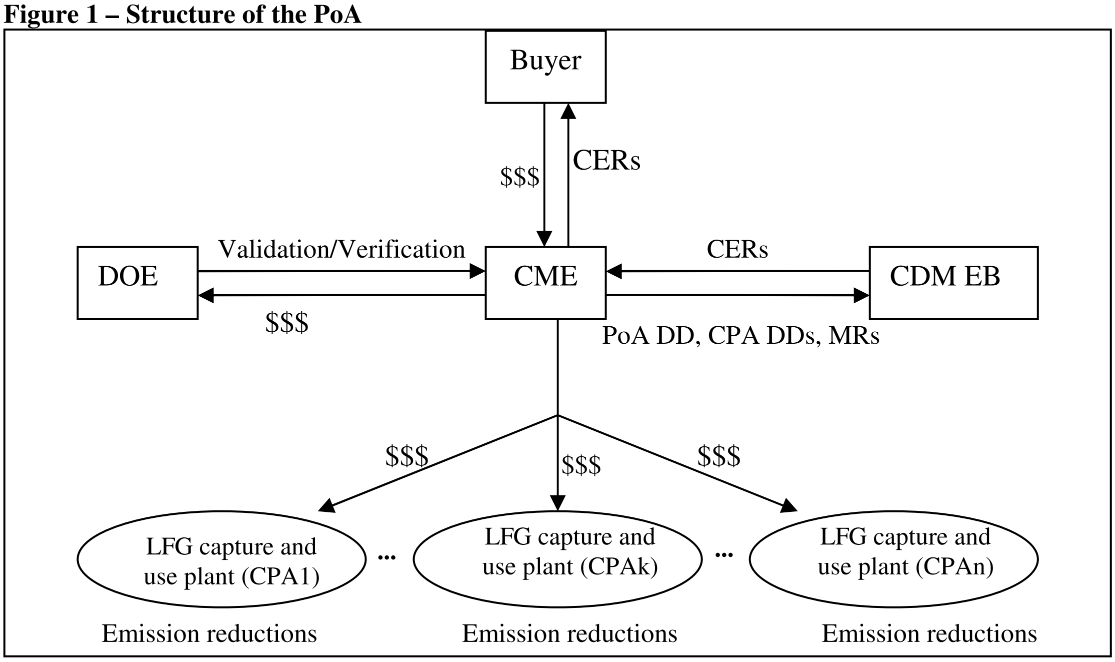
The core idea of LFG recovery to power Programme of Activities in China (hereafter as "the PoA") is to promote the implementation of profitable LFG capture and usage to power projects in China, by offering to landfill owners and/or waste management entities (e.g. municipalities, environmental protection agencies, private companies dealing with landfills, etc.) an **integrated engineering, financing and CDM development service**, which would overcome the barriers that currently prevent a wider and faster spreading of this practice. In other words, the PoA consists in offering a service (including CDM support) that makes the implementation of LFG capture and usage to power easier and economically attractive.
In summary, the stated goal of the PoA is **to promote the implementation of LFG capture and usage to power projects in China by offering integrated financial, engineering and CDM services**.
The existing scenario prior to the implementation of PoA is that the huge potential of LFG use in China is released to atmosphere without utilization and the equivalent electricity is from the grid of China.

Each CPA under the PoA will reduce the greenhouse gas (GHG) emissions by destroying methane in the LFG generated from landfills and replacing the equivalent amount of electricity from grid dominated by fossil fuel power plant.

[1] The title of PoA was changed from "LFG recovery to power Programme of Activities in China" to "Henan BCCY New Power Industry Co., Ltd. LFG recovery to power Programme of Activities". Such change makes PoA easy to be identified and compliance with the regulation of host country.

Henan BCCY New Power Industry Co., Ltd. (BCCY) – a leading company in China in the sector of LFG capture and usage –is the CME of the PoA, and will promote LFG capture and usage projects by offering engineering services and financial support (both in the form of equity investments or debt securing) in this sector.
First Climate (Beijing) Co., Ltd. (FCB) – the Chinese branch of First Climate Group, one of the primary global carbon asset management companies, with more than 11 years experience in the CDM – will assist the CME as a consultant in developing and implementing the PoA.
The framework for the implementation of the proposed PoA is presented in Figure 1 below.

Figure 1 – Structure of the PoA



The CME confirms that the proposed PoA is a voluntary action, as there is no law in the host country that forces or mandates any of the project participants to engage in any of the activities included in the PoA.

The PoA will contribute to the sustainable development in the host country, not only it because of avoiding global warming, but also because it increases the availability of electricity from renewable sources. The PoA will minimize the explosion risk at the landfill site, remove the terrible odours and improve the air quality of local area by destroying LFG. In addition, the PoA will create job opportunities through the construction and operation of the LFG capture system and the power units.

A.3. CMEs and participants of PoA

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Henan BCCY New Power Industry Co., Ltd. (BCCY) is the CME of the PoA and will communicate with the Executive Board.
First Climate Markets AG is a Project Participant to the PoA and it may or may not be involved in one of the component project activities (CPAs) related to the PoA.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
China (host)	Henan BCCY New Power Industry Co., Ltd. (CME, private entity)	No
Germany	First Climate Markets AG (private entity)	No

A.5. Physical/ Geographical boundary of the PoA

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People's Republic of China

The CME has taken into consideration towards national and sectoral policies and regulations within China.

A.6. Technologies/measures

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The types and categories of the PoA are Type III – Other project activities, sectoral scope 13: Waste handling and disposal and Type I – Renewable energy projects, sectoral scope 01: Energy Industries (renewable / non-renewable sources).

Each CPA is a greenfield plant which consists of LFG collection, transmission and pre-treatment system, with subsequent electricity generation and delivery to the grid, with possible partial flaring.

LFG collection system

LFG is extracted from solid waste disposal site (SWDS) under negative pressure by blower pumps and moved through wells, then collected by LFG collection stations and transferred by sub-pipes and a main pipe to LFG treatment equipment. Flow rate of the LFG is regulated at the collection points in order to always fit with the consumption capacity of the generation engines.

LFG pre-treatment system

Prior to electricity generation, LFG is treated to remove impurities and moisture, to avoid corrosion in the engines. The treatment consists of filtration, demoisturing, cooling and pressurization.

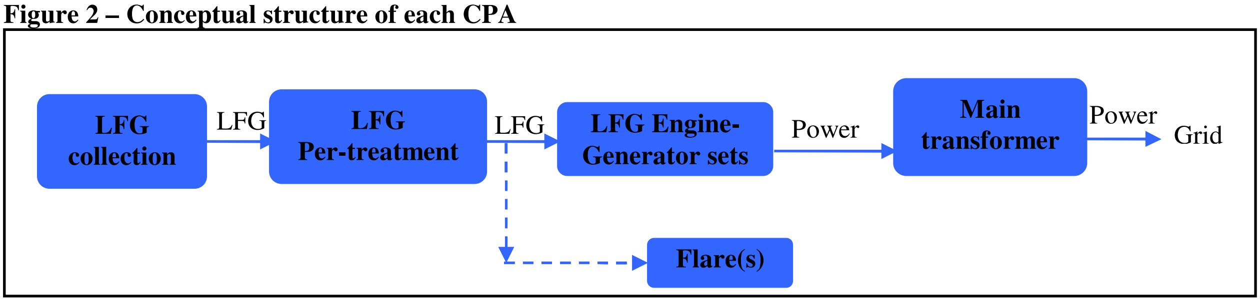
Electricity generation and grid connection system

Gas engines are fed with the LFG and generate electricity, which is then delivered to the grid.

LFG Flare system (optional)

Excess LFG which can not be utilized by the engines is delivered to one or more flares.

Figure 2 – Conceptual structure of each CPA



A.7. Public funding of PoA

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The PoA does not receive any public funding from Parties included in Annex I.

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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(i) Demonstration that in the absence of the CDM, CPAs would not be implemented;

In the absence of the CDM, which means in the absence of the CDM financial support, LFG projects would not happen, because of their low profitability. This is demonstrated by means of investment barrier, which shows that for the set of inputs of each CPA (total investment, electricity tariff, expected electricity production, O&M costs, etc.), only thanks to the CDM the project IRR raises above the applicable sectoral benchmark.

CPAs additionality implies PoA additionality, because, if CPAs were feasible without CDM, then the promoters of the CPAs would not need to participate in the PoA, and there would be no scope for it.

(ii) In the absence of the CDM, the mandatory policy/regulation would be systematically not enforced in China;

As there are mandatory regulations to require recovery and utilization of LFG, but it should demonstrate in each CPA that mandatory regulations to require recovery and utilization of LFG are not enforced.

(iii) The PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

As demonstration in section B.4 of Part II below, excluding the landfill sites related with CDM projects, there were less than 0.51% landfill sites in China which flared and utilized LFG. The PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation of flaring or utilization of LFG.

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

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All CPAs compliant with the following criteria are eligible as CPAs under this PoA:

No.	**Eligibility criteria required by "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities"**	**Eligibility criteria of the PoA**
1	*(a) The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA;*	The CPA takes place in China.
2	*(b) Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);*	The CPA is not already registered as a single CDM project or part of another registered CDM PoA or identical with another CPA already included in this PoA (geographical coordinates are used to check this criterion)
3	*(c) The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;*	The CPA consists in the installation of a LFG capture and usage system, including electricity generation system to utilize the captured LFG and/or partial flaring.
4	*(d) Conditions to check the start date of the CPA through documentary evidence;*	The CPA start date is not before the start of the PoA GSC. The start date of CPA must be indicated as the earliest date at which of a real

		action, such as the main equipment purchase contract, construction contract and construction start report, etc.
5	*(e) Conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies applied by CPAs;*	The CPA complies with applicability and other requirements of methodologies AMS-III.G and AMS-I.D. See "B.2. Application of methodology(ies)" of Part II.
6	*(f) The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality (please refer to the latest approved version of the "Standard for demonstration of additionality of a programme of activities");*	The CPA meets all the relevant requirements of "Guidelines on the Demonstration of Additionality of Small-scale Project Activities" for the demonstration of additionality.
7	*(g) The PoA-specific requirements stipulated by the CMEs including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;*	The CPA has completed the required local stakeholder consultation and the environmental impact analysis (or equivalent environmental assessment, as per national regulations).
8	*(h) Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation);*	The CPA exports electricity to the grid or to identified consumer via grid which would buy electricity from the grid, for which it is possible to determine the CO_2 emission factor per unit of electricity distributed (tCO_2e/MWh). If this is not possible, no emission reduction can be claimed for the electricity displacement (but only for the methane emission avoidance part).
9	*(i) Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys;*	Each CPA under the PoA will utilize monitoring rather than sampling for the determination of parameter values for calculating emission reductions. Therefore, sampling requirements are not applicable.
10	*(j) Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria (please refer to the latest approved version of the "Guidelines for demonstrating additionality of microscale project activities") and the latest approved version of the "General Guidelines to SSC CDM Methodologies") and remain within those thresholds throughout the crediting period of the CPA;*	As the PoA adopts the combination of AMS-I.D and AMS-III.G., the CPA shall meet the thresholds of a maximum output of 15MW for type I and emission reduction not exceeding 60kt CO2e per year for type III throughout the crediting period of the CPA.
11	*(k) Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories (please refer to the latest approved version of the "Guidelines on assessment of debundling for SSC project activities");*	The CPA will not be a debundled component of a large project activity, according to the "Guidelines on assessment of debundling for SSC project activities".
12	*(l) Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance.*	Provide an affirmation that CPA under the PoA does not receive any public funding from Parties included in Annex I, or that in case such public funding is involved, it dose not result in diversion of Official Development Assistance

		(ODA).

B.3. Application of methodologies
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Applied technology/measures:
Each CPA consists of LFG collection, transmission and pre-treatment system, with subsequent electricity generation and delivery to the grid, with possible partial flaring.

Applied methodologies:
AMS-III.G: Landfill Methane Recovery - Version 7.0
AMS-I.D: Grid connected renewable electricity generation - Version 17.0

Each CPA under the PoA will utilize monitoring rather than sampling for the determination of parameter values for calculating emission reductions. Therefore, no sampling is required in any CPA.

SECTION C. Management system
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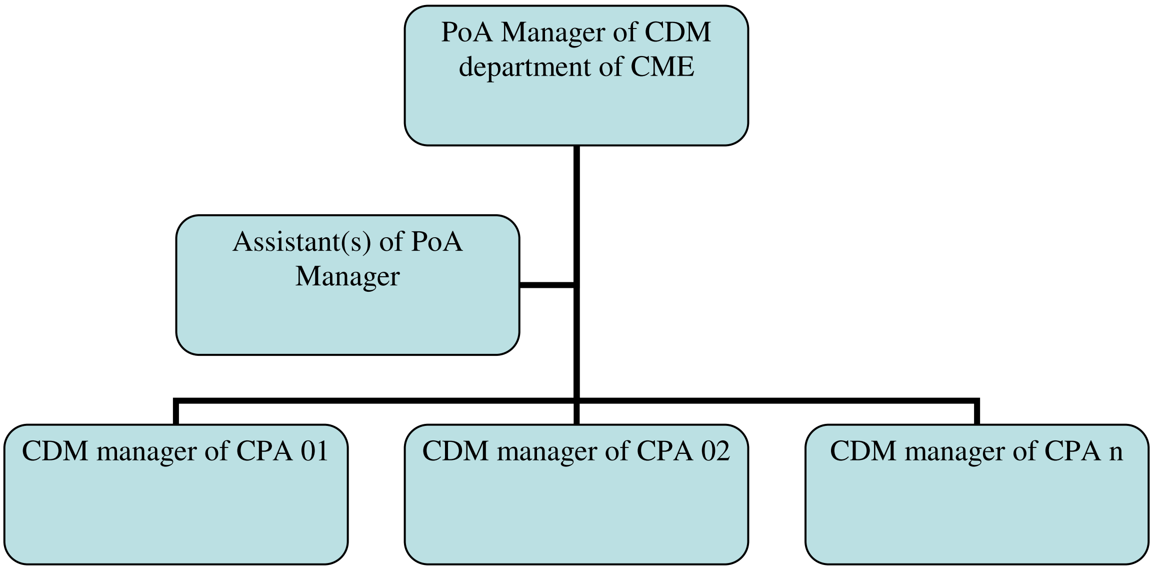
The CME will establish a CDM department to manage the PoA by the following procedures:

(a) Roles and responsibilities of personnel



PoA Manager is the leader of CDM department of CME. He/She is responsible for overall issues of PoA and training to ensure that staff of CME and CPA implementers has the ability to deal with the tasks relating to CDM issue.

Assistant(s) of PoA Manager is the staff(s) from CME whose's responsibilities are:

- collecting and archiving data and documents of CPA;
- preparing monitoring report;
- including CPA into PoA

CDM manager of each CPA is the staff from CPA implementer. He/She is specifically responsible for training, checking the daily operation, reporting forms and archiving emergency situation reports.

(b) Procedure for training and capacity development
CME staff who is responsible for the PoA will receive training to develop its competence in managing the PoA. The CME will arrange regular training for the CPA owners.

(c) Procedure for technical review of inclusion of CPAs
A checklist of eligibility criteria will be formulated after the registration of PoA and updated from time to time to ensure that each CPA meets all requirements for inclusion in the registered PoA. Supporting documents will be provided to CME to check whether the eligibility criteria has been satisfied.

(d) Procedure to avoid double counting
Each CPA consists of a LFG capture and usage plant, for which a geographical location and coordinates are provided in the CPA-DD.
In the CPA addition phase, it will be possible to check that the new CPA has not already been added into the PoA or any other PoA, nor it is an already registered CDM project activity.

(e) Procedure for record and documentation control process
Each CPA will be managed by dedicated staff, with an internal organization that will ensure smooth operation of the LFG capture and usage plant, from the technical and administrative point of view.
The CME will ensure that a homogenous reporting practice is adopted in all CPAs and will collect centrally all the data needed for the emission reductions calculation.

(f) Measure for continual improvements of the PoA management
Every year, the PoA management will summarize the work of the PoA and share the experience in the CDM department and update the management system, if possible. The external expert of CDM will be consulted regularly for the management of PoA.

(g) Provisions to ensure CPAs awareness of inclusion in the PoA
Participation of the CPAs into the PoA will be regulated by a specific statement by the CPA owner, which agrees the CPA to be included in the PoA and agrees Henan BCCY New Power Industry Co., Ltd. as the CME. Therefore, at the moment of the CPA owner issues such statement, it will be aware and consent to include its CPA into the PoA.

SECTION D. Duration of PoA
D.1. Start date of PoA
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24/01/2012 (first date of PoA DD published for Global Stakeholder Consultation (GSC), which corresponds to the first real action by the CME to engage into the PoA).

D.2. Length of the PoA
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28 years

The CME does not put any limit in its LFG capture and usage promotion activity. Therefore, the PoA is envisaged to continue as long as the CDM is in place, up the maximum duration allowed for the PoA.

SECTION E. Environmental impacts
E.1. Level at which environmental analysis is undertaken
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Environmental Analysis is done at CPA level.

According to the laws and regulations of the host country, each LFG capture and usage plant has to be specifically authorized, with regard to its environmental compliance, by the competent Environmental

Bureau. Therefore, the environmental analysis cannot be performed at PoA level, but has to be performed specifically for each CPA.

E.2. Analysis of the environmental impacts

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Not available, as environmental Analysis is done at CPA level.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

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The local stakeholder consultation process is performed at the CPA level.

The boundary of PoA is too large to perform local stakeholder consultation process properly. The local stakeholder consultations are more suitable for local resident to express their opinions, because people who are closer to the site where the project are to be implemented can have a more specific understanding of the details of the project and related impact. Therefore, the local stakeholder consultation process is selected to perform at CPA level.

F.2. Summary of comments received

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Not available, as local stakeholder consultant process is performed at CPA level.

F.3. Report on consideration of comments received

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Not available, as local stakeholder consultant process is performed at CPA level.

SECTION G. Approval and authorization

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The letters of approval from the parties indicated in Part I, section A.4 are not available at the time of submitting the PoA-DD to the validating DOE.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

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Each CPA under PoA aims at recovering LFG from an identified landfill site to generate electricity and possibly flare part of it. Without the implementation of the CPA, the LFG would be directly released to the atmosphere and the equivalent electricity would be supplied by the regional power grid. Hence the CPA reduces the CH_4 emissions into atmosphere from the landfill site and the CO_2 emissions from the grid.

Each CPA consists of LFG collection, transmission and pre-treatment system, with subsequent electricity generation and delivery to the grid, with possible partial flaring.

LFG collection system

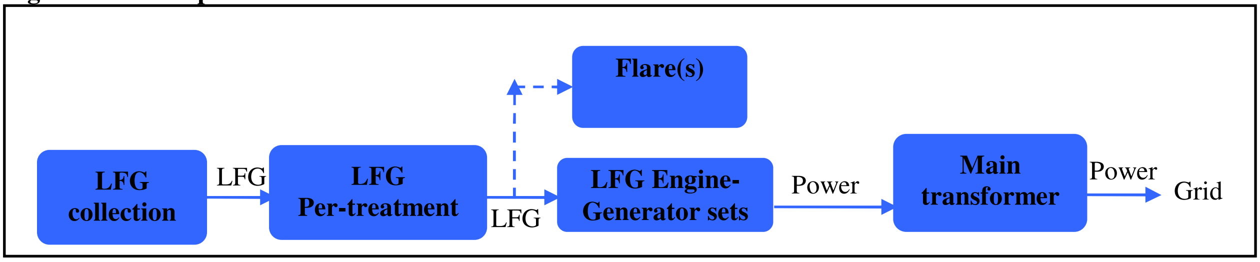
LFG is extracted from solid waste disposal site (SWDS) under negative pressure by blower pumps and moved through wells, then collected by LFG collection stations and transferred by sub-pipes and a main pipe to LFG treatment equipment. Flow rate of the LFG is regulated at the collection points in order to always fit with the consumption capacity of the generation engines.

LFG pre-treatment system
Prior to electricity generation, LFG is treated to remove impurities and moisture, to avoid corrosion in the engines. The treatment consists of filtration, demoisturing, cooling and pressurization.

Electricity generation and grid connection system
Gas engines are fed with the LFG and generate electricity, which is then delivered to the grid.

LFG Flare system (optional)
Excess LFG which can not be utilized by the engines is delivered to an open flare.

Figure 3 – Conceptual structure of each CPA



SECTION B. Application of a baseline and monitoring methodology
B.1. Reference of the approved baseline and monitoring methodology(ies) selected
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Applied methodology:
AMS-III.G: Landfill Methane Recovery - Version 7.0
AMS-I.D: Grid connected renewable electricity generation - Version 17.0

Both selected methodologies are approved for application to CPAs under PoAs.

Cited tools:
- AMS-III.H: Methane recovery in wastewater treatment" – version 16.0
- Methodological tool "Emission from solid waste disposal sites" – Version 06.0.1
- Tool to determine project emissions from flaring gases containing methane – Version 01
- Tool to calculate the emission factor for an electricity system - Version 02.2.1
- "Guidelines on the Demonstration of Additionality of Small-scale Project Activities" - Version 09.0
- Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities - Version 02.1

Reference: cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Application of methodology(ies)
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The CPA collects and utilizes LFG from the SWSD for power generation, which would otherwise be released into the atmosphere. Therefore the project avoids methane emissions and, at the same time, electricity is generated from a renewable energy source and it is delivered to the grid. No heat will be supplied by the CPA. The CPA complies with the applicability conditions of small scale methodologies AMS-III.G and AMS-I.D, as shown in the following tables:

Applicability conditions for AMS-III.G	*Check*
1. This project category comprises measures to capture and combust methane from landfills (i.e., solid waste disposal sites) used for disposal of residues from human activities	The CPA consists of capturing and combusting LFG (which contains methane) from a landfill site, which is

including municipal, industrial, and other solid wastes containing biodegradable organic matter.	used for disposal of residues from human activities. Therefore this condition is fulfilled.
2. Different options to utilise the recovered landfill gas as detailed in paragraph 3 of AMS-III.H "Methane recovery in wastewater treatment" (version 16) are eligible for use under this methodology. The relevant procedures in AMS-III.H shall be followed in this regard. The recovered methane from the above measures may also be utilized for the following applications instead of flaring or combustion: (a) Thermal or mechanical, electrical energy generation directly; (b) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas, in this case additional guidance provided in Annex I shall be followed; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this casa additional guidance provided in Annex I shall be followed: i. Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; ii. Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or iii. Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (d) Hydrogen production. (e) Use as fuel in transportation applications after upgrading.	The recovered methane is utilized for electrical generation directly (i.e. by gas engines included in the project boundary) – option (a). Therefore it is satisfied with the application (a).
3. According to paragraph 3 of AMS-III.H. "If the recovered biogas methane is used for project activities covered under paragraph 2 (a), that component of the project activity shall use a corresponding category under type I.	The CPA uses methodology AMS-I.D. for the power generation component. Therefore this condition is fulfilled.
4. Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO2 equivalent annually from all type III components of the project activity.	The CPA results in aggregate emission reduction of less than 60 kt CO_2 equivalent annually from all type III components. Therefore this condition is fulfilled.

Applicability conditions for AMS-I.D	***Check***
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; (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling	The CPA generates electricity from a renewable biomass (biogas) and supplies it to corresponding regional grid or to identified consumer via grid. Therefore this condition is fulfilled.
2. Illustration of situations under the methodology AMS-I.D as follows: • Project supplies electricity to a national/regional grid; • Project supplies electricity to an identified consumer	The CPA plans to supply electricity to corresponding regional grid. Therefore this condition is fulfilled.

facility via national/regional grid (through a contractual arrangement such as wheeling)	
3. 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 addition1; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The CPA installs a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the CPA (greenfield plant). Therefore this condition of (a) is fulfilled.
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 (A reservoir is to be considered as an "existing reservoir" if it has been in operation for at least three years before the implementation of the project activity.), where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	Not applicable (the CPA is not a hydro power plant).
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 new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable (the CPA does not use non-renewable components nor co-fires fossil fuels).
6. Combined heat and power (co-generation) systems are not eligible under this category	The CPA does not co-generate heat and power (only power). Therefore this condition is fulfilled.
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 distinct6 from the existing units.	Not applicable (the CPA does not involve addition of renewable energy generation units at an existing renewable power generation facility).
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable (the CPA project is not a retrofit or replacement)

B.3. Sources and GHGs

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According to AMS-III.G *"the project boundary is the physical, geographical site of the landfill where the gas is captured and destroyed/used."* and AMS-I.D *"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that*

the CDM project power plant is connected to." Therefore, the boundary of each CPA includes the site where the LFG is captured and, as applicable:

- Sites where the LFG is flared or used (e.g. flare, power plant);
- Captive power plant(s) or power generation sources connected to the grid, which are supplying electricity to each CPA;
- Captive power plant(s) or power generation sources connected to the grid, which are supplying electricity in the baseline that is displaced by electricity generated by each CPA.
- Each CPA boundary is within the geographical boundary of China.

Each CPA utilizes the LFG generated from a SWDS to generate and supply electricity to the grid with possible partial flaring. The CPA plant site and the landfill site, where the LFG is captured and used for electricity generation, are in the boundary of each CPA. The boundary of each CPA also includes the LFG collection system, LFG pre-treatment system, the gas-generator sets, possible partial flaring system, and also includes all the power sources connected physically to the electricity system that each CPA connects to.

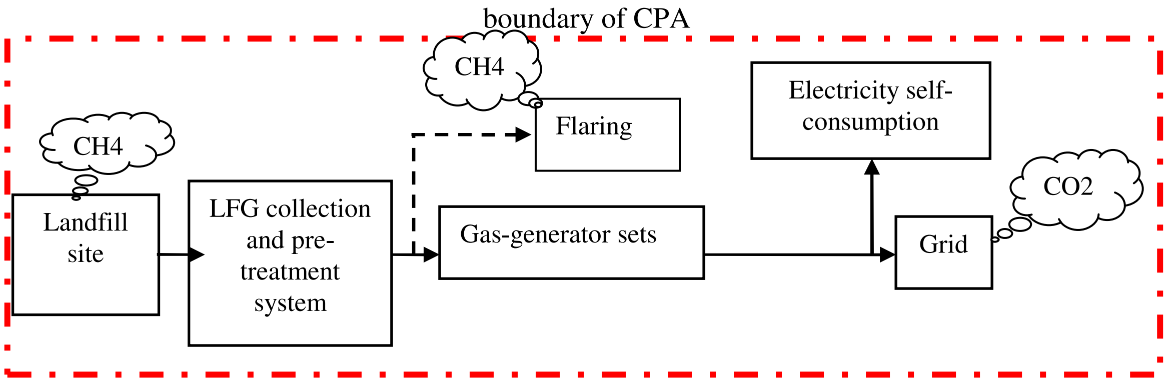

Figure 4 the Diagram of Boundary of Each CPA

The data and parameters to be monitored and corresponding monitoring meters are shown in Figure 6 Monitoring System in section B.7.2 below.

Table B.1 Emission sources included or excluded from the boundary of CPA

	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from decomposition of waste at the SWDS site	CH_4	Yes	The major source of emissions in the baseline
		N_2O	No	N_2O emissions are small compared to CH_4 emissions. Exclusion of this gas is conservative.
		CO_2	No	CO_2 emissions from the decomposition of organic waste are not accounted.
	Emissions from electricity generation	CO_2	Yes	The major source of emissions because the electricity is consumed from the grid in the baseline.
		CH_4	No	Excluded for simplification, this is conservative.
		N_2O	No	Excluded for simplification, this is conservative.
	Emissions from heat generation	CO_2	No	No heat generation is involved.
		CH_4	No	No heat generation is involved.
		N_2O	No	No heat generation is involved.
	Emissions from the use of natural gas	CO_2	No	No use of natural gas is involved.
		CH_4	No	No use of natural gas is involved.
		N_2O	No	No use of natural gas is involved.
Project Activity	Emissions from fossil fuel consumption for the purposes other than electricity generation or transportation due to the project activity	CO_2	No	Excluded because there is no fossil fuel consumption.
		CH_4	No	Excluded because there is no fossil fuel consumption.
		N_2O	No	Excluded because there is no fossil fuel consumption.
	Emissions from electricity consumption due to the project activity	CO_2	Yes	Possible emission source.
		CH_4	No	Excluded for simplification. This emission source is very small compared to CO_2 emissions.
		N_2O	No	Excluded for simplification. This emission source is very small compared to CO_2 emissions.
	Emission from LFG flaring	CH_4	Yes	Possible emission source.
		CO_2	No	Not covered by the "Tool to determine project emissions from flaring gases containing methane"
		N_2O	No	Not covered by the "Tool to determine project emissions from flaring gases containing methane"

B.4. Description of baseline scenario

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<u>For the methane avoidance component of the project, according to AMS-III.G:</u>

"The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter are left to decay within the project boundary and methane is emitted to the atmosphere. Baseline emissions shall exclude methane emissions that would have to be removed to comply with national or local safety requirement or legal regulations"

Currently China has regulations in place to deal with the management of landfills and to encourage utilization of LFG. Those regulations are:

- "Technical Code for Municipal Solid Waste Sanitary Landfill" (CJJ 17-2004), issued by the Ministry of Construction on 01/06/2004.
  Item 8.0.1 of CJJ 17-2004 states that landfill sites should have effective degassing facilities installed. If the LFG cannot be utilized, it should be flared.

- "Standard for Pollution Control on the Landfill Site of Municipal Solid Waste" (GB 16889-2008), which became effective in 2008, issued by the Environment Protection Administration.
  Item 5.15 of GB 16889-2008 states that landfill sites with designed acceptance capacity larger than 2.5 million tonnes and depth higher than 20 meter should construct LFG utilization facilities or flare to destruct methane. Landfills smaller than the size mentioned above, should adopt technologies which could effectively reduce production and emission of methane or install a flare to destruct it.

In December 2005, the document "Promoting Methane Recovery and Utilization from Mixed Municipal Refuse in China, Terminal Evaluation Report"[2] stated:

> *"At present, in China the municipal refuse is disposed of by using the technology of traditional landfill, without consideration of recovery and utilization of landfill methane. It is estimated that the annual quantity of municipal refuse filled is about 50 million tons. Almost all landfills are not equipped with the system of landfill gas recovery, except several new built landfills, and the landfill methane is emitted to the atmosphere openly."*

Moreover, in February 2007, the Ministry of Construction issued the "Circular on the Outcome of Nationwide Inspection on Hazard-free Treatment of Domestic Waste Landfill Sites"[3]. As per this Circular, by the end of year 2005, 372 landfills existed across 31 provinces, autonomous regions and municipalities in China. 92.76% of these the 372 landfills did not have LFG recovery and usage facilities. Furthermore, according to "China Development Report on Urban Domestic Refuse Disposal Industry 2010"[4], by the end of 2009 in China there were 447 domestic landfill sites but only in 35 sites LFG was flared or utilized by the end of 2009. As per CDM pipeline issued by 01/11/2011, there are 61 plants generating electricity with utilization LFG started CDM validation, and 4 of them are validation terminated. Only 2 of the 4 validation terminated projects are totally and partially in operation[5]. Thus, there were less than 0.51% landfill sites (excluding the landfill sites related with CDM projects) in China which flared and utilized LFG by the end of 2009.

On the basis of above evidence, it is justifiable to conclude that the specific requirements on methane recovery and utilization as prescribed in CJJ17-2004 and GB 16889-2008 have not been systematically enforced and that noncompliance with those requirements, namely uncontrolled emission of methane to the atmosphere without any recovery, has been and still is widespread in China.

Therefore, LFG capture and usage is not enforced in China. So, it can be concluded that, in the absence of the project, methane would be continuously released into the atmosphere as in most of landfill sites around China. LFG released into atmosphere is the baseline scenario for each CPA.

For the power generation component of the project, according to AMS-I.D:

"The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

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[2] "Promoting Methane Recovery and Utilization from Mixed Municipal Refuse in China, Terminal Evaluation Report" submitted to Development Programme & Department of Economic and Social Affairs of the United Nations and State Environmental Protection Administration of the People's Republic of China in December 2005. Reference: http://erc.undp.org/evaluationadmin/downloaddocument.html?docid=558

[3] http://www.huanke.com.cn/08/article.asp?articleid=416

[4] "China Development Report on Urban Domestic Refuse Disposal Industry 2010", published in China Environmental Protection Industry in April, 2011, Committee of Urban Domestic Refuge Disposal of CAEPI, Beijing 100037, China

[5] According to CDM pipeline, the validation of 4 projects, Xuzhou Landfill Gas Utilisation Project, Xining Landfills Gas Recovery Project, Huai'an Wang Yuan Landfill Gas Utilisation Project, and Baishan Landfills Gas Recovery Project, was terminated. The first two projects are in operation.
Xuzhou Landfill Gas Utilisation Project and Xining Landfills Gas Recovery Project have been put into operation
http://www.xuzhoujob.com/News/3200942085210.html
http://www.qhfgw.gov.cn/gzgf/fgwwj/t20100824_345399.shtml

The CPA is a new grid-connected renewable power unit, therefore the baseline is the one indicated in the methodology, i.e. electricity would be provided by the grid.

Conclusion:

The most plausible baseline scenario is that the LFG is released to the atmosphere and the electricity is generated by grid-connected power plants.

B.5. Demonstration of eligibility for a generic CPA

>>

Demonstrate how each generic CPA meets the eligibility criteria of the PoA including confirmation of additionality of the generic CPA for its inclusion into the PoA is show below:

No.	***Eligibility criteria of the PoA***	***Demonstrate how each generic CPA meets the eligibility criteria of the PoA***
1	The CPA takes place in China.	The geographical coordinates of the CPA should be within China.
2	The CPA is not already registered as a single CDM project or part of another registered CDM PoA or identical with another CPA already included in this PoA (geographical coordinates are used to check this criterion)	The CME will ensure that the CPA is not already registered as a CDM project activity or is included in another registered PoA or identical with another CPA already included in this PoA by checking geographical coordinates.
3	The CPA consists in the installation of a LFG capture and usage system, including electricity generation system to utilize the captured LFG and/or partial flaring.	In CPA-DD, the description of CPA shows that the CPA consists in the installation of a LFG capture and usage system, including electricity generation system to utilize the captured LFG and/or partial flaring. And the Feasibility Study Report (FSR) of the CPA should support such description.
4	The CPA start date is not before the start of the PoA GSC. The start date of CPA must be indicated as the earliest date at which of a real action, such as the main equipment purchase contract, construction contract and construction start report, etc.	In CPA-DD, the start date must be indicated as the earliest date at which of a real action, such as the main equipment purchase contract, construction contract and construction start report, etc. and supported by relevant documentary evidence. And then comparing the start date of CPA and the start date of GSC of the PoA.
5	The CPA complies with applicability and other requirements of methodologies AMS-III.G and AMS-I.D.	In CPA-DD, it shall be demonstrated that the CPA can comply with applicability and other requirements of methodologies AMS-III.G and AMS-I.D.
6	The CPA meets all the relevant requirements of “Guidelines on the Demonstration of Additionality of Small-scale Project Activities” for the demonstration of additionality. .	See “Demonstration of additionality for CPA” below. FSR is the basis for investment barrier analysis. FSR of the CPA and IRR calculation spreadsheet are provided to DOE.
7	Local stakeholder consultations and environmental impact analysis for each CPA should be undertaken.	In CPA-DD, details pertaining to the local stakeholder consultation and environmental impact analysis for the CPA shall be available. Minutes of the meeting, attendant list and

		Environmental Impact Assessment compiled by qualified entity shall be available for check.
8	The CPA exports electricity to the grid or to identified consumer via grid which would have bought electricity from the grid, for which it is possible to determine the CO_2 emission factor per unit of electricity distributed (tCO_2e/MWh). If this is not possible, no emission reduction can be claimed for the electricity displacement (but only for the methane emission avoidance part).	In CPA-DD, it shall clear indicate that the electricity generated by the CPA is delivered to the grid or to identified consumer via grid which would have bought electricity from the grid. The electricity purchase agreement or other support evidence shall be available for check.
9	Sampling requirements are not applicable.	Not applicable.
10	As the PoA adopts the combination of AMS-I.D and AMS-III.G., the CPAs shall meet the thresholds of a maximum output of 15MW for type I and emission reduction not exceeding 60kt CO2e per year for type III throughout the crediting period of the CPAs.	The total capacity in CPA-DD shall be no more than 15MW and the estimated maximum emission reduction shall not exceed 60kt CO2e per year for the component of AMS-III.G. throughout the crediting period of each CPA The technical section of the generator purchase agreement and the Emission Reduction Calculation Spreadsheet will be used for checking.
11	The CPA is not a debundled component of a large project activity, according to the "Guidelines on assessment of debundling for SSC project activities".	In each CPA-DD, it will be demonstrated that the CPA is not be a debundled component of a large project activity, according to "Guidelines on Assessment of Debundling for SSC Project Activities".
12	Provide an affirmation that CPA under the PoA does not receive any public funding from Parties included in Annex I, or that in case such public funding is involved, it dose not result in diversion of Official Development Assistance (ODA).	In CPA-DD, such affirmation shall be included.

Demonstration of additionality for CPA

(i) *Demonstration that in the absence of the CDM, CPAs would not be implemented;*

According to the "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities", *PoAs that consist of one or more small-scale projects as CPAs shall include eligibility criteria derived from all the relevant requirements of "Guidelines on the Demonstration of Additionality of Small-scale Project Activities".*

In the absence of the PoA, which means in the absence of the CDM financial support, LFG projects would not happen, because of their low profitability (investment barrier – option a, according to the *"Guidelines on the Demonstration of Additionality of Small-scale Project Activities"*). This is demonstrated by means of an investment analysis, which shows that for the set of inputs of each CPA (total investment, electricity tariff, expected electricity production, O&M costs, etc.), without the CDM revenue, the project IRR would be below the applicable benchmark and therefore not viable. Only thanks to the PoA, which significantly increases the project IRR, such projects become viable.
CPAs additionality implies PoA additionality, because, if CPAs were feasible without CDM, then the implementer of the CPAs would not need to participate in the PoA, and there would be no scope for it.

CME shall demonstrate that the CDM was seriously considered in the decision to implement the CPA according to *"Clean Development Mechanism Project Standard"*.

Assessment and demonstration of additionality is carried out through the following steps:
Step 1: Select applicable benchmark
Step 2: Calculate the post-tax project IRR with and without CDM revenue using reasonable inputs
Step 3: Conduct sensitivity analysis
Step 4: Summarize conclusions

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

As the description of baseline scenario of B.4, LFG capture and usage is not enforced in China.

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>
Estimation of the Emission Reductions (ER) of a CPA is done according to the selected methodologies. Basically, amount of LFG destroyed and amount of electricity produced are provided by the technical study of the CPA.
Baseline emissions are determined from the amount of LFG destroyed and the net electricity delivered to the grid, according to the equations described below.
The emission factor of the electricity system to which electricity is delivered is determined according to the "Tool to calculate the emission factor for an electricity system".
Project emissions and leakage are also calculated referring to the selected methodologies and referred tools, as indicated specifically below.

According to the selected methodologies, Emission Reductions are to be calculated as follows:

Baseline emissions (ex-ante estimation)

According to the adopted methodologies, baseline emissions are to be calculated (ex-ante) as:

For AMS-III.G: $$BE_{y,1} = BE_{CH4,SWDS,y} - MD_{reg,y} \cdot GWP_{CH4} \quad (1)$$

For AMS-I.D: $$BE_{y,2} = EG_{BL,y} \cdot EF_{CO2,grid,y} \quad (2)$$

According to the Feasibility Study Report, it is estimated that not all potential methane emissions of a solid waste disposal site ($BE_{CH4,SWDS,y}$) can be captured from the landfill, but just a portion can be captured and utilised by the project. Therefore formula (1) is revised as:

$$BE_{y,1} = p_{captured} * BE_{CH4,SWDS,y} - MD_{reg,y} * GWP_{CH4} \quad (3)$$

Where:

BE_y	Baseline emissions in year y (tCO_2e)
$BE_{y,1}$	Baseline emissions due to methane destroyed in year y (tCO_2e)
$BE_{y,2}$	Baseline emissions due to electricity displacement in year y (tCO_2e)
$BE_{CH4,SWDS,y}$	Potential methane emissions of a solid waste disposal site in year y (tCO_2e), calculated using the methodological tool "Emissions from solid waste disposal sites"
$MD_{reg,y}$	Methane emissions that would be captured and destroyed to comply with national or

	local safety requirement or legal regulations in the year y (t_{CH4})
GWP_{CH4}	Global Warming Potential for methane (value of 21)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CPA in year y (MWh)
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year y (tCO_2e/MWh), calculated using the "Tool to calculate the Emission Factor for an electricity system"
$p_{captured}$	Portion of the LFG captured by the collection system of the project

In summary, ex-ante baseline emissions are calculated as:

$$BE_y = p_{captured} \cdot BE_{CH4,SWDS,y} - MD_{reg,y} \cdot GWP_{CH4} + EG_{BL,y} \cdot EF_{CO2,grid,y} \quad (4)$$

Determination of $BE_{CH4,SWDS,y}$

According to the adopted methodology, $BE_{CH4,SWDS,y}$ is determined using the tool *"Emissions from solid waste disposal sites"*. CPAs will mitigate methane emissions by capturing and combusting the methane emitted by an existing landfill. Therefore, CPAs belong to "Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS".
Also, since data about waste disposal are available on a yearly basis, the yearly model is chosen.
The amount of methane generated from disposal of waste at the SWDS is calculated for year y using the equation:

$$BE_{CH4,SWDS,y} = \varphi_y (1-f_y) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-kj(y-x)} (1-e^{-kj}) \quad (5)$$

Where:

$BE_{CH4,SWDS,y}$	= Baseline methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (tCO_2e/yr)
x	= Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x=1) to the year (x=y)
y	= Year for the crediting period from which methane emissions are calculated (y is a consecutive period of 12 months)
$DOC_{f,y}$	= Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	= Amount of waste type j disposed or prevented from disposal in the SWDS in the year x
φ_y	= Model correction factor to account for model uncertainties for year y
f_y	= Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
GWP_{CH4}	= Global warming potential of methane
OX	= Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	= Fraction of methane in the SWDS gas (volume fraction)
MCF_y	= Methane Correction Factor for year y
DOC_j	= Fraction of degradable organic carbon in the waste type j (weight fraction)
k_j	= Decay rate for the waste type j
j	= Type of residual waste or types of waste in the MSW

Determining the parameters required to apply the first order decay (FOD) model
Overview of the option to determine parameters

<table>
<tr><th>Parameter</th><th>Application A</th><th>Value adopted for Application A</th></tr>
<tr><td>φ_y</td><td>Default value</td><td>Based on the application A, for the baseline emissions, the default value is as follow:
<table><tr><td>Humid/wet conditions</td><td>Dry conditions</td></tr><tr><td>0.75</td><td>0.75</td></tr></table></td></tr>
<tr><td>OX</td><td>Default value</td><td>0.1</td></tr>
<tr><td>F</td><td>Default value</td><td>0.5</td></tr>
<tr><td>$DOC_{f,y}$</td><td>Default value</td><td>0.5</td></tr>
<tr><td>MCF_y</td><td>Default value (based on SWDS type)</td><td>Use the following values for MCF:
• 1.0 for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste;
• 0.5 for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layers: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system;
• 0.8 for unmanaged solid waste disposal sites – deep. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters;
• 0.4 for unmanaged-shallow solid waste disposal sites. This comprises all SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)</td></tr>
<tr><td>k_j</td><td>Default value (based on waste type)</td><td><table>
<tr><td colspan="2" rowspan="2">Waste type j</td><td colspan="2">Boreal and temperate (MAT ≤ 20 °C)</td><td colspan="2">Tropical (MAT>20 °C)</td></tr>
<tr><td>Dry (MAP/PET < 1)</td><td>Wet (MAP/PET > 1)</td><td>Dry (MAP< 1000mm)</td><td>Wet (MAP> 1000mm)</td></tr>
<tr><td rowspan="2">Slow degrading</td><td>Pulp, paper and cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr>
<tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr>
<tr><td>Moderately degrading</td><td>Other (non food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr>
<tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.06</td><td>0.185</td><td>0.085</td><td>0.40</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>$W_{j,x}$</td><td>Estimated once</td><td>See section B.6.2 (value depends on CPA)</td></tr>
<tr><td>DOC_j</td><td>Default value (based on waste type)</td><td>
<table>
<tr><th>Waste type j</th><th>DOC_j (% wet waste)</th></tr>
<tr><td>W_1-Wood and wood products</td><td>43</td></tr>
<tr><td>W_2-Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr>
<tr><td>W_3-Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr>
<tr><td>W_4-Textiles</td><td>24</td></tr>
<tr><td>W_5-Garden, yard and park waste</td><td>20</td></tr>
<tr><td>W_6-Glass, plastic, metal, other inert waste</td><td>0</td></tr>
</table>
The percentages listed in the table above are based on a wet waste basis which are concentrations in the waste as it is delivered to the SWDS.</td></tr>
<tr><td>f_y</td><td>Estimated once</td><td>See section B.6.2 (value depends on CPA)</td></tr>
</table>

Determining the model correction factor (φ_y)

The model correction factor (φ_y) depends on the uncertainty of the parameters used in the FOD model. As baseline emissions are being calculated, then project participants may choose between two options to calculate (φ_y). Option 1: Use a default value; Option 2: Determine φ_y based on specific situation of the project activity. There are many CPAs under PoA, so the specific situation of each CPA cannot be identified at PoA level, so Option 1 is chosen for all CPAs.

Option 1: Use a default value

Use a default value: $\varphi_y = \varphi_{default}$. Default values for different applications and climatic conditions are provided in the section "B.6.2 Data and parameters that are to be reported ex-ante".

Determining the amounts of waste types j disposed in the SWDS ($W_{j,x}$)

For Application A, calculate $W_{j,x}$ based on information from the SWDS owner and administration and from interviews with senior employees. The total amount of waste can be calculated from the SWDS surface area and average depth, assuming a specific weight of 1-1.2 t per cubic meter. If the SWDS has distinct compartments and if the amount of waste per compartment and the exploitation period of a compartment is known, then the amounts of waste for a specific series of years can be obtained. Further historic information on amounts, composition and origin of the waste might be found in SWDS administration documents (e.g. contracts with clients and invoices to clients) or obtained from old business plans or business evaluations.

The landfill owner provided the evaluations of total amount of solid waste disposed in every year of its lifetime and average fractions of different waste types in the waste, which are used to calculate $W_{j,x}$

$$W_{j,x} = W_x \cdot p_j \tag{6}$$

W_x = Total amount of solid waste disposed or prevented from disposal in the SWDS in year x

p_j = Average fraction of the waste type j (weight fraction)

Determination of the emission factor for electricity generation ($EF_{CO2,grid,y}$)

According to the methodology AMS I.D., the emission factor ($EF_{CO2,grid,y}$) can be calculated as a combine margin (CM) ($EF_{grid,CM,y}$) according to the procedures prescribed in "*Tool to calculate the*

emission factor for an electricity system"

The operating margin emission factor and the build margin emission factor used for calculating emission reduction of the project was updated 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 more information on the published OM and BM emission factors, please see details at http://cdm.ccchina.gov.cn

According to the latest version of the "Tool to calculate the emission factor for an electricity system", the grid emission factor is determined by calculating the "combined margin" emission factor (CM) of the electricity system. The CM is the weighted average of two emission factors pertaining to the electricity system: the "operating margin"(OM) and the "build margin"(BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CDM project activity.

The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2e/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2e/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2e/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

$EF_{grid,OM,y}$, $EF_{grid,BM,y}$ $EF_{grid,CM,y}$ are calculated by the following steps:

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

The Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$) calculation for the Central China Power Grid is calculated as follows:

STEP 1. Identify the relevant electricity systems

Chinese DNA has published a delineation of the project electricity system and connected electricity systems, which is adopted by this project. The power generated by each CPA displaces the equivalent electricity generated by the Grid, which is the project electricity system. The Grid is a large regional grid published by Chinese DNA. There may be electricity imported from connected electricity systems to the project system.

In addition, there is net imported power to the Grid from other Grids, which are connected electricity systems. According to the "*Tool to calculate the emission factor for an electricity system*", use one of the following options to determine the CO_2 emission factor for net electricity imports from a connected electricity system:
$0tCO_2e/MWh$, or

a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 (d) below; or
b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4(a), if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or
c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4(b) below.

The CPA-DDs will choose option c) to calculate the CO_2 emission factor for net electricity imports from other Grids.

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

Option I: Only grid power plants are included in the calculation.
OptionII: Both grid power plants and off-grid power plants are included in the calculation.

Based on the actual situation of China, the Option I has been chosen for the calculation (because the option II aims to reflect that in some countries off-grid power generation is significant and can partially be replaced by CDM project activities).

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

"Tool to calculate the emission factor for an electricity system" offers four methods for the calculation of the operating margin emission factor(s) ($EF_{grid,OM,y}$):

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

In the recent five years (data available), in the composition of gross annual generation power for the Grid, the ratio of power generated by hydro-power and other low cost/must run resources should be lower than 50%. Based on these considerations, Simple OM is appropriate to be used for calculated OM.

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

- *Ex ante* option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the mission factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;
- *Ex post* option: If the *ex post* option is chosen, the emission factor is determined for 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 is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods

Project participant employs *ex ante* option for its operation margin calculation. The data vintage chosen should be documented in the CDM-PDD and should not be changed during the crediting period.

STEP 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit

net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

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

Option B can only be used if:

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

The Option B is chosen.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}\right)}{EG_y} \quad (7)$$

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2e/MWh);
$FC_{i,y}$	= Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit);
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit), National fixed value;
$EF_{CO_2,i,y}$	= CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2e/GJ), IPCC Guidelines for default values;
EG_y	= Net electricity generated and delivered to the grid by power plant / unit *m* in year *y* (MWh).

The electricity imports from other Grids to the Grid will be considered as power sources. Because it is impossible to identify the proposed power plants of the other Grid exporting electricity to the Grid, so the other Grids will be taken into account.

The operating margin emission factor of the baseline is calculated ex-ante and will not be renewed in the crediting period of the project activity. The operating margin emission factors for recent three years (data available) are calculated. The three-year average is calculated as a weighted average of the emission factors.

The data resources for calculating $EF_{grid,OM,y}$ are:

- Power generation and the rate of internal electricity consumption of thermal power plants
  Source: *China Electric Power Yearbook*; *China Energy Statistical Yearbook and Compilation of China Electric Power Industry Statistics*
- Fuel consumption and the net caloric value of thermal power plants
  Source: *China Energy Statistical Yearbook*

- CO_2 emission factor of each fuel
  Source: *IPCC Guidelines for default values*

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 CPA-DDs choose Option 1, which requires the project participant to calculate the build margin emission factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available already built for sample group m at the time of PDD submission

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (8)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2e/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_2e/MWh).

Project participants should use the set of power units that comprises the larger annual generation.

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. According to the guidance from the CDM Executive Board for a deviation of the baseline methodology of AM0005 (M-DEV0004: Application of AM0005 and AMS-I.D in China), the following deviation was adopted to calculate the Build Margin emission factor[6].

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

[6] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. 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.

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:

- First, according to the statistical data of the most recent one year, determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad (9)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in gas,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad (10)$$

$$\lambda_{oil,y} = \frac{\sum_{i \in oil,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad (11)$$

Where,

$FC_{i,m,y}$ = Amount of fuel i consumed by relevant power unit m in year y (Mass or Volume unit);

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i (coal, oil and gas) in year y (GJ/Mass or Volume unit);

$EF_{CO_2,i,y}$ = CO_2 emission factor of fossil fuel type i (coal, oil and gas) in year y(tCO_2e/GJ).

Coal, Oil and *Gas* is solid fuel, liquid fuel and gas fuel respectively.

Sub-step 2: Calculate the operating margin emission factor of fuel-based generation.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (12)$$

Where,

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$, $EF_{Gas,Adv,y}$ are the emission factors of coal, oil and gas-fired power generation with efficiency levels of the best commercially available technology in China in the previous three years.

Sub-step 3: Calculate the Building Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (13)$$

Where,

$CAP_{Total,y}$	= Total capacity addition of the selected period in which approximately 20% capacity has been added to the grid
$CAP_{Thermal,y}$	= Total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

The data resources for calculating $EF_{grid,BM,y}$ are:

- Installed capacities of different power in the Central China Power Grid
  Source: *China Electric Power Yearbook*
- Fuel consumption and the net caloric value of thermal power plants
  Source: *China Energy Statistical Yearbook*
- CO_2 emission factor of coal-fired, oil-fired and gas-fired power
  Source: *Baseline Emission Factors for Regional Power Grids in China*

STEP 6. Calculate the combined margin emissions factor

According to the latest version of the "Tool to calculate the emission factor for an electricity system", the weighted average CM method (option A) is used. The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \quad (14)$$

$$w_{OM} = 0.5\,;\, w_{BM} = 0.5$$

Project emissions

According to the adopted methodologies, project emissions are to be calculated as:

For AMS-III.G: $PE_y = PE_{power,y} + PE_{flare,y} + PE_{process,y}$ (15)

PE_y	Project emissions in 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)
$PE_{flare,y}$	Emissions from flaring or combustion of the landfill gas stream in the year *y* (tCO_2e)
$PE_{process,y}$	Emissions from the landfill gas upgrading process in the year y (tCO_2e), determined by following the relevant procedures described in Annex 1 of AMS-III.H

For AMS-I.D: project emissions are only to be considered for geothermal and hydro power plants, and in addition, CO_2 emissions from on-site fossil fuel consumption shall be taken into account. Since the

project involves neither geothermal nor hydro power plants, and there is no fossil fuel consumption in the CPA, project emissions as per AMS-I.D are 0.

Determination of $PE_{power,y}$

Project emissions from electricity consumption are determined as per the procedures described in AMS-I.D "Grid connected renewable electricity generation". Since the project generates electricity, internal electricity consumption is deducted from the gross generation, and only the net export is taken into account to calculate the emission reductions. Therefore, there is no need to consider the electricity consumption under this item.
Also, since there is no use of fossil fuels for the operation of the project activity, $PE_{powe,y} = 0$.

Determination of $PE_{flare,y}$

In case flaring (single or multiple) is used to destroy all or part of the recovered LFG, project emissions from flaring in year y ($PE_{flare,y}$ in tCO2e) shall be determined following the procedure described in the "Tool to determine project emissions from flaring gases containing methane" for each flare respectively.

According to the "Tool to determine project emissions from flaring gases containing methane", project emissions from flaring of the residual gas stream are calculated based on the flare efficiency and the mass flow rate of methane in the LFG that is flared. The flare efficiency depends on both the actual efficiency of combustion in the flare and the time that the flare is operating. The efficiency of combustion in the flare is calculated from the methane content in the exhaust gas of the flare, corrected for the air used in the combustion process, and the methane content in the residual gas.

For open flares, a default value of 50% is to be used provided that it can be demonstrated that the flare is operational (e.g. through a flame detection system reporting electronically on continuous basis). If the flare is not operational the default value to be adopted for flare efficiency is 0%.

For enclosed flares, the temperature in the exhaust gas of the flare is measured to determine whether the flare is operating or not.
For enclosed flares, either of the following two options can be used to determine the flare efficiency:
(a) To use a 90% default value. Continuous monitoring of compliance with manufacturer's specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit of manufacturer's specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour.
(b) Continuous monitoring of the methane destruction efficiency of the flare (flare efficiency).
In both cases, if there is no record of the temperature of the exhaust gas of the flare or if the recorded temperature is less than 500 °C for any particular hour, it shall be assumed that during that hour the flare efficiency is zero.

CME should document in the CPA-DD, which type of flare and which approach to determine the flare efficiency is used. In case of use of the default value for the methane destruction efficiency, the manufacturer's specifications for the operation of the flare and the required data and procedures to monitor these specifications should be documented in the CPA-DD.

For each CPA, the flare type is indicated and the respective efficiency is calculated.

$PE_{flare,y}$ is determined by the following seven steps:

STEP 1: Determination of the mass flow rate of the residual gas that is flared

STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas
STEP 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis
STEP 4: Determination of methane mass flow rate of the exhaust gas on a dry basis
STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis
STEP 6: Determination of the hourly flare efficiency
STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies.

Project participants shall apply these steps to calculate project emissions from flaring ($\boldsymbol{PE_{flare,y}}$) based on the measured hourly flare efficiency or based on the default values for the flare efficiency ($\boldsymbol{\eta_{flare,h}}$). Note that steps 3 and 4 are only applicable in case of enclosed flares and continuous monitoring of the flare efficiency.
The calculation procedure in this tool determines the flow rate of methane before and after the destruction in the flare, taking into account the amount of air supplied to the combustion reaction and the exhaust gas composition (oxygen and methane). The flare efficiency is calculated for each hour of a year based either on measurements or default values plus operational parameters. Project emissions are determined by multiplying the methane flow rate in the residual gas with the flare efficiency for each hour of the year.

STEP 1: Determination of the mass flow rate of the residual gas that is flared

This step is skipped, because the quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions.

STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas

This step is skipped, because the quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions.

STEP 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis

This step is skipped, because the default value is use to determine the flare efficiency.
STEP 4: Determination of methane mass flow rate of the exhaust gas on a dry basis

This step is skipped, because the default value is use to determine the flare efficiency.

STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis). It is necessary to refer both measurements (flow rate of the residual gas and volumetric fraction of methane in the residual gas) to the same reference condition that may be dry or wet basis. If the residual gas moisture is significant (temperature greater than 60ºC), the measured flow rate of the residual gas that is usually referred to wet basis should be corrected to dry basis due to the fact that the measurement of methane is usually undertaken on a dry basis (i.e. water is removed before sample analysis).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (16)$$

Where:

$TM_{RG,h}$	kg/h	Mass flow rate of methane in the residual gas in the hour *h*
$FV_{RG,h}$	m^3/h	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h*
$fv_{CH4,RG,h}$	-	Volumetric fraction of methane in the residual gas on dry basis in hour *h* (NB: this corresponds to $fv_{i,RG,h}$ where *i* refers to methane).
$\rho_{CH4,n}$	kg/m^3	Density of methane at normal conditions (0.716)

STEP 6: Determination of the hourly flare efficiency

The flare efficiency of the PoA, is determined by the default value.

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

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h*.
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.

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

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flame is detected for more than 20 minutes during the hour *h*.

STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies.

Project emissions from flaring are calculated as the sum of emissions from each hour h, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\eta_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \left(1 - \eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000} \quad (17)$$

Where:

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

Constants used in equations

Parameter	*SI Unit*	*Description*	*Value*
P_n	Pa	Atmospheric pressure at normal conditions	101,325
T_n	K	Temperature at normal conditions	273.15
R_u	$Pa.m^3/kmol.K$	Universal ideal gases constant	8,314
GWP_{CH4}	tCO^2/tCH_4	Global warming potential of methane	21
$\rho_{CH4,n}$	kg/m^3	Density of methane gas at normal conditions	0.716

Determination of $PE_{process,y}$

The CPA recovers LFG for power generation and does not involve upgrading process, therefore, $PE_{process,y}$ is equal to 0.

Leakage emissions
According to AMS-III.G:
If the methane recovery technology is equipment transferred from another activity, leakage effects are to be considered.
Similarly, according to AMS-I.D:
If the energy generating equipment is transferred from another activity, leakage is to be considered.

in each CPA, confirm if there is any equipment transferred from another activity. If not, LEy=0

Emission Reductions (ex-ante)
According to AMS-III.G, the expected emission reductions achieved by the CPA are estimated ex-ante as:

$$ER_{y,estimated} = BE_y - PE_y - LE_y \quad (18)$$

By combining all the above equations, the ex-ante estimate of the emission reduction is:

$$ER_{y,estimated} = p_{captured} \cdot BE_{CH4,SWDS,y} - MD_{reg,y} \cdot GWP_{CH4} + EG_{BL,y} \cdot EF_{CO2,grid,y} - PE_{flare,y} - LE_y \quad (19)$$

Emission Reductions (ex-post)
According to AMS-III.G, the actual emission reduction achieved by the CPA will be calculated using the amount of methane actually recovered and destroyed/gainfully used by the project activity, calculated as:

$$ER_{y,calculated} = \left(MD_y - MD_{reg,y}\right) \cdot GWP_{CH4} - PE_y - LE_y \quad (20)$$

Where:
MD_y is methane captured and destroyed/gainfully used by the project activity in the year y (t_{CH4}).

$$MD_y = w_{CH4,y} \cdot D_{CH4,y} \cdot \sum_i LFG_{i,y} \quad (21)$$

Where:
$LFG_{i,y}$ Landfill gas destroyed via method i (flaring, fuelling, combustion, injection in a grid, etc.) in the year *y* (m^3LFG)
$w_{CH4,y}$ Methane content in LFG in the year y (volume fraction, m^3CH4 /m^3LFG)
$D_{CH4,y}$ Density of methane at the temperature and pressure of the landfill gas in the year *y* (tonnes/m^3)

Given that in each CPA, LFG is destroyed either via flaring or combustion for power generation, the following equation is established:

$$\sum_i LFG_{i,y} = LFG_{total,y} = LFG_{flare,y} + LFG_{electricity,y} \quad (21\text{-}1)$$

where:

$LFG_{flare,y}$ Volume of LFG sent to flaring at normal conditions in year y

$LFG_{electricity,y}$ Volume of LFG sent to power generation at normal conditions in year y

In conclusion, actual emission reductions are calculated as:

$$ER_{y,calculated} = \left(w_{CH4,y} \cdot D_{CH4,y} \cdot LFG_{total,y} - MD_{reg,y}\right) \cdot GWP_{CH4} + EG_{BL,y} \cdot EF_{CO2,grid,y} - PE_{flare,y} - LE_y \quad (22)$$

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

Data / Parameter	$EGP_{y,j}$
Unit	MWh
Description	Power generated by source j in the year y
Source of data	China Electric Power Yearbooks China Energy Statistical Yearbooks
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Official Statistical Data
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$GEN_{import,y}$
Unit	MWh
Description	Power imported from other grid in year y
Source of data	Compilation of Electric Power Industry Statistics
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Official Statistical Data
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	PR_y
Unit	%
Description	Rate of electricity consumption of thermal power plants in year y
Source of data	China Electric Power Yearbooks
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Official Statistical Data
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$FC_{i,y}$
Unit	10^4t/10^8m^3
Description	Quantity of fuel i (in a mass or volume unit) consumed by power plant j feeding the project electricity system in year y
Source of data	China Energy Statistical Yearbooks
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Official Statistical Data
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$NCV_{i,y}$
Unit	MJ/ fuel in a mass or volume unit
Description	The Net Calorific Values of Fuel i (mass or volume unit) in year y
Source of data	China Energy Statistical Yearbooks
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	National Fixed Value
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$EF_{CO_2,i,y}$
Unit	tC/TJ
Description	The Emission Factor of Fuel *i* in a mass or volume unit in year y
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	IPCC Default Value
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$EF_{Coal,Adv,y}$
Unit	%
Description	Commercially available coal-fired power plant corresponding to the best practice in terms of efficiency
Source of data	Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	National Fixed Value
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$EF_{Gas,Adv,y}$
Unit	%
Description	Commercially available gas-fired power plant corresponding to the best practice in terms of efficiency
Source of data	Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	National Fixed Value
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$EF_{Oil,Adv,y}$
Unit	%
Description	Commercially available oil-fired power plant corresponding to the best practice in terms of efficiency
Source of data	Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	National Fixed Value
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	$CAP_{y,j}$
Unit	MW
Description	The Install Capacity of Power Sources j in the year y
Source of data	China Electric Power Yearbooks
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Official Statistical Data
Purpose of data	Calculation of baseline emissions (grid emission factor)
Additional comment	/

Data / Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	CH_4 global warming potential of CH_4
Source of data	IPCC
Value(s) applied	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$p_{captured}$
Unit	Dimensionless
Description	Efficiency of the LFG capture system that will be installed in the project activity
Source of data	Provided at CPA level
Value(s) applied	Provided at CPA level
Choice of data or Measurement methods and procedures	Technical specifications of the LFG capture system to be installed (if available) or a default value of 50%
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Step A.1.1

Data / Parameter	$W_{j,x}$
Unit	t
Description	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x
Source of data	Estimated based on total amount of waste prevented from disposal and average weight fraction of the waste type collected
Value(s) applied	Values are estimated at CPA level
Choice of data or Measurement methods and procedures	For application A, the parameter is estimated once based on the total amount of waste disposed of and average weight fraction of the waste type.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	f_y
Unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Value(s) applied	0
Choice of data or Measurement methods and procedures	For application A: Estimated once for the crediting period (f_y) According to the methodology of ACM0001, f_y in the tool shall be assigned a value 0 because the amount for LFG that would have been captured and destroyed is already accounted for $BE_{CH4,y}$.
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

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Baseline emissions

$$BE_y = p_{captured} \cdot BE_{CH4,SWDS,y} - MD_{reg,y} \cdot GWP_{CH4} + EG_{BL,y} \cdot EF_{CO2,grid,y}$$

$$BE_{CH4,SWDS,y} = \varphi_y (1-f_y) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-kj(y-x)} (1-e^{-kj})$$

Project emissions

$$PE_y = PE_{power,y} + PE_{flare,y} + PE_{process,y}$$

$$PE_{power,y} = 0$$

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

$$PE_{process,y} = 0$$

Leakage emissions

$$LE_y = 0$$

Emission Reductions

$$ER_{y,estimated} = BE_y - PE_y - LE_y$$

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	$LFG_{total,y}$
Unit	Nm^3 (dry basis)
Description	Total amount of LFG captured at Normal Temperature and Pressure in year y
Source of data	Measurements by project participants using a flow meter
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Measured continuously by flow meter(s), and recorded at least once per hour. Data to be aggregated monthly and yearly.
Monitoring frequency	continuously
QA/QC procedures	The flow meter(s) (accuracy: XX) should be calibrated once per year, in accordance with the national standard.
Purpose of data	Calculation of baseline emissions
Additional comments	The flow meter(s) automatically measures temperature and pressure, expressing LFG volumes in Normalized cubic meters (Nm^3). Data will be archived during the crediting period and kept until two years after. In case the flow meter can neither measure temperature nor pressure simultaneously, the thermometer and manometer should be installed.

Data / Parameter	$LFG_{electricity,y}$ ($LFG_{,i,y}$, where i index combustion for electricity)
Unit	Nm^3 (dry basis)
Description	Amount of LFG combusted to generate power at Normal Temperature and Pressure in year y
Source of data	Measurements by project participants using a flow meter
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Measured continuously by flow meter(s), and recorded at least once per hour. Data to be aggregated monthly and yearly.
Monitoring frequency	continuously
QA/QC procedures	Flow meter(s) (accuracy: XX) should be calibrated once per year, in accordance with the national standard.
Purpose of data	Calculation of baseline emissions
Additional comments	Flow meter(s) will automatically measure temperature and pressure, expressing LFG volumes in Normalized cubic meters (Nm^3). Data will be archived during the crediting period and kept until two years after. In case the flow meter can neither measure temperature nor pressure simultaneously, the thermometer and manometer should be installed.

Data / Parameter	$LFG_{flare,h}$ ($FV_{RG,h}$, $LFG_{,i,y}$, where i index flaring)
Unit	Nm^3/h (dry gas)
Description	Volumetric flow rate of the LFG to be flared in dry basis at normal conditions in the hour *h*
Source of data	Measurements by project participants using a flow meter
Value(s) applied	Provided at CPA level
Measurement methods and procedures	If the CPA will not employ volumetric flow meters, which can convert volumetric flow to normal conditions, volumetric flow measurement will refer to the actual pressure and temperature.
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval.
QA/QC procedures	Flow meter(s) (accuracy: XX) should be calibrated once per year, in accordance with the national standard.
Purpose of data	Calculation of project emissions
Additional comments	Monitored only in case of flaring. Flow meters will automatically measure temperature and pressure, expressing LFG volumes in Normalized cubic meters (Nm^3). Data will be archived during the crediting period and kept until two years after. In case the flow meter can neither measure temperature nor pressure simultaneously, the thermometer and manometer should be installed.

Data / Parameter	$w_{CH4,y}$ (equivalent also to $fv_{CH4,RG,h}$)
Unit	m^3 CH_4/m^3 dry gas
Description	Volumetric fraction of CH_4 in the LFG in the hour *h* on a dry basis
Source of data	Measurements by project participants using a continuous gas analyser
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Continuous gas analyser operating in dry-basis, if not specified in the underlying methodology. Volumetric flow measurement should always refer to the actual pressure and temperature. Some CPAs will be possible to employ volumetric flow meters, which can convert volumetric flow to normal conditions.
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures	Calibration should include zero verification with an inert gas (e.g. N_2) and at least every one year with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period. accuracy: XX
Purpose of data	Calculation of baseline emissions and project emissions
Additional comments	As a simplified approach, project participants may only measure the volumetric fraction of methane and consider the remaining part as nitrogen (N_2).

Data / Parameter	T_t
Unit	K
Description	Temperature of the LFG in time interval t
Source of data	On-site measures
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Continuous unless differently specified in the underlying methodology. Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	hourly
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration is according to manufacturer's specifications and the frequency of calibration is every year. accuracy: XX
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is monitored only in case of flaring and/or if LFG flow measures are not already automatically adjusted for temperature and pressure. Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency). Besides, this parameter must be monitored continuously to assure the applicability condition, i.e. the gaseous stream flow temperature being below 60°C, is met.

Data / Parameter	P_t
Unit	Pa
Description	Pressure of the LFG in time interval t
Source of data	On-site measures
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Continuous unless differently specified in the underlying methodology. Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	hourly
QA/QC procedures	Periodic calibration against a primary device must be performed periodically and records of calibration procedures must be kept available as well as the primary device and its calibration certificate. Pressure transducers (either capacitive or resistive) must be calibrated yearly. accuracy: XX
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is monitored only in case of flaring and/or if LFG flow measures are not already automatically adjusted for temperature and pressure. Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency).

Data / Parameter	T_{flare}
Unit	°C
Description	Temperature in the exhaust gas of the flare
Source of data	Measurements by project participants
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 ºC indicates that a significant amount of gases are still being burnt and that the flare is operating.
Monitoring frequency	Continuously.
QA/QC procedures	Thermocouples should be replaced or calibrated every year. accuracy: XX
Purpose of data	Calculation of project emissions
Additional comments	An excessively high temperature at the sampling point (above 700 ºC) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow.

Data / Parameter	***Other flare operation parameters (only for open flare)***
Unit	-
Description	This should include all data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer's specifications including a flame detector in case of open flares.
Source of data	Measurements by project participants
Value(s) applied	Provided at CPA level
Measurement methods and procedures	-
Monitoring frequency	Continuously
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Only applicable in case of use of a default value

Data / Parameter	$\mathbf{EG_{BL,y}}$
Unit	MWh/y
Description	Net amount of electricity supplied to the grid or consumer that would have bought electricity from grid as a result of the implementation of the CPA in year y
Source of data	Electricity meter
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Measured continuously by electricity meter(s). This parameter represents the difference between the amount of electricity exported to the grid and imported from the grid. The data is measured and recorded hourly, and aggregated monthly.
Monitoring frequency	continuously
QA/QC procedures	Cross check measurement results with invoices for electricity sale. Electricity meter (Accuracy: XX) will be subject to a regular calibration, in accordance with Stipulated Procedures for Technical Administration of Electricity Metering Equipment (DL/T448-2000).
Purpose of data	Calculation of baseline emissions
Additional comments	Data will be archived during the crediting period and kept until two years after.

Data / Parameter	**$MD_{reg,y}$**
Unit	tCO_2e
Description	Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year y (tCO_2e)
Source of data	Relevant laws and regulations
Value(s) applied	Provided at CPA level
Measurement methods and procedures	Regular follow-up of laws and regulations by project participants (e.g. governmental publications, official communications, official journal, conference).
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA

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For all CPA a similar (if not identical) monitoring plan will be adopted, with the goal to define the distribution and the timetable for the monitoring tasks. Based on the monitoring activities, reports on the real and measurable emission reductions achieved by the CPA will be prepared and submitted for verification.

Part 1.Objective

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of emission reductions during the whole crediting period of the CPA. CPA implementers will be responsible for the implementation of the monitoring plan under the supervision of the CME.

This monitoring plan sets out a number of monitoring tasks in order to ensure that all aspects of emission reductions calculation for all CPAs are controlled and reported. This requires an on-going monitoring of the project to ensure performance according to its design and that claimed Emission Reductions (ERs) are actually achieved.

The monitoring plan is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of CPAs. The monitoring plan will be used throughout the defined crediting period for each CPA to determine and provide documentation of GHG emission impacts from each CPA.

Part 2. Responsibilities of operational and management structure

Each CPA implementer will implement the respective monitoring plan. The plan could be revised according to suggestions from DOE and the practical circumstances, in order to keep it consistent, transparent and conservative during the monitoring process.

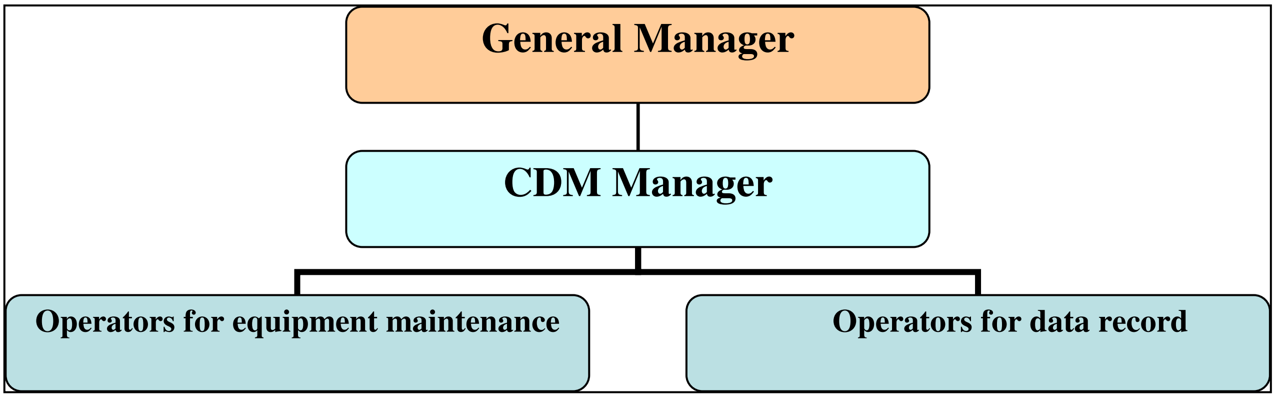

Figure 5 Operational and management structure

1. Principal of the monitoring procedure

The general manager of the CPA implementer is the leader of the monitoring tasks: he/she sets out the responsibility of everyone in the monitoring system, and establishes the related documents. The general manager ensures that staff in the monitoring system has the ability to deal with the assigned tasks.

2. Executive person of the monitoring procedure

CDM Managers: CDM Managers are appointed for respective CPAs, specifically responsible for training, checking the daily operation, reporting forms and archiving emergency situation reports. The CDM Managers report monthly to the General Manager (GM) about the project performance and monitored data. In the event that non-conformance in the performance to the mentioned procedures and/or functioning problems of the monitoring equipment are identified, the CDM managers will inform the GM about the situation and work out relevant measures to be taken. The CDM managers will also be responsible for aggregating the monitored data monthly and yearly, archiving and keeping data during the crediting period and two years after.

3. Operators of the monitoring procedure

Operators will take turns to work in the control centre 24 hours a day. They will be in charge of data supervision, filling operation report forms and, checking and inspecting the system. If necessary, they will have the responsibility for executing the emergency plan and drafting emergency situation reports.

4. Training plan

The monitoring staff is trained together. The project owner sent training notification and training content and schedule to all trainees. All attendances have to sign-in and give feedback to courses. The training records are archived for verification.

Part 3.Monitoring system

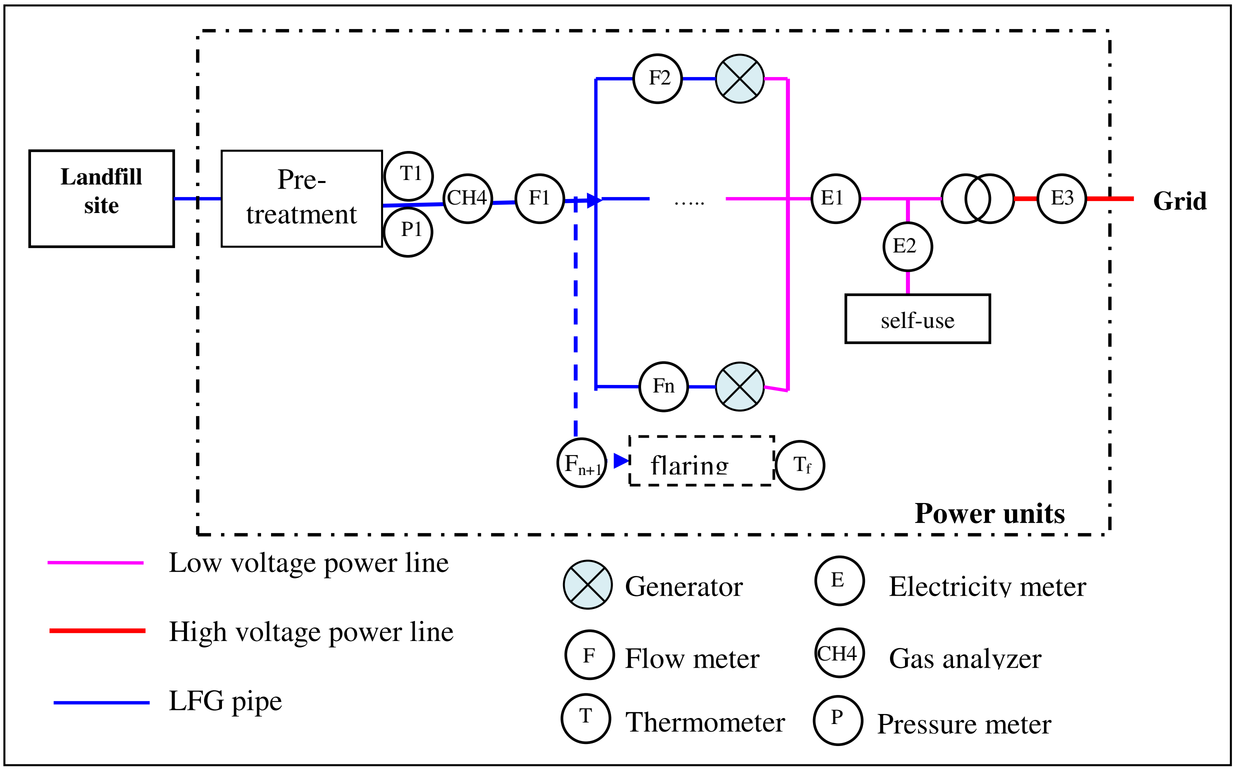

Figure 6 Monitoring System

Main monitoring equipment:

CH_4 – Gas analyzer to continuously measure methane fraction in LFG ($v_{CH4,t,db}$ / $fv_{CH4,RG,h}$).

F1 – Flow meter to continuously measure flow rate of total captured LFG ($LFG_{total,y}$, unit: Nm^3/h), with automatic measure adjustment for temperature and pressure. If automatic adjustment is not available, additional instruments **T1** (thermometer) and **P1** (pressure meter) are used to monitor parameters T_t and P_t.

F2~Fn – Flow meters to continuously measure flow rates of combusted LFG for power generation of each generator set, with automatic measure adjustment for temperature and pressure. If automatic adjustment is not available, additional instruments **T1** (thermometer) and **P1** (pressure meter) are used to monitor parameters T_t and P_t. The sum of all readings of F2~Fn is the total LFG flow rate used for electricity generation ($LFG_{electricity,y}$, unit: Nm^3/h).

Fn+1 – Flow meter to continuously measure flow rates of flared LFG, with automatic measure adjustment for temperature and pressure. ($LFG_{flare,y}$, unit: Nm^3/h).

E1 - Electricity meter to continuously measure the total electricity generated by all generators.

E2 - Electricity meter to continuously measure the electricity consumed by the CPA.

E3 - Electricity meter (main meter, bi-directional) to continuously measure the amount of electricity supplied to the grid ($EG_{BL,y}$).

T1 - Thermometer to continuously measure the temperature of gas after the pre-treatment. (only in case LFG flow measures are not already automatically adjusted for temperature and pressure)

P1 - pressure meter to continuously measure the pressure of gas after the pre-treatment. (only in case LFG flow measures are not already automatically adjusted for temperature and pressure)

T_f – Thermometer to continuously measure the temperature of the flare exhaust gas (only for enclosed flares).

Total amount of LFG captured

Flow meter (F1), flow meter (F2~Fn) and flow meter (Fn+1) monitor the total amount of LFG captured and fed to the gas engines and fed to flaring (if the CPA has flaring)**,** respectively.
The monitoring frequency is continuous. The data will be recorded and electronic archived once per hour by computer automatically. The operators will check the data daily, and totalize the data monthly.

Methane fraction in the LFG
A cellular gas analyzer will continuously monitor the methane concentration in the LFG. Data will be electronically recorded and archived once per hour. The operators will check the data daily, and totalize the data monthly.

Net electricity exported to the grid
Electricity meter E3 is the main meter for monitoring the net amount of electricity generated using LFG and onsite consumption of electricity provided by the grid.
Electricity meter E3 is usually installed by the grid company at the project site. The electricity data are recorded and archived by the DCS automatically and shown in the grid company control system. The data will be recorded monthly. The electricity receipts will be used as cross check during verification. E3 will be calibrated by a qualified party once a year according to the industry standards and applicable regulations.
As a back up monitoring system, the other two meters E1 and E2 will be installed at the project site and will monitor the total electricity generation (EG_{total}) and self-consumption (EG_{self}), respectively. When E3 does not work normally, the net electricity EG_{BL} can be calculated as EG_{total} - EG_{self}.

Part 4. QA/QC
All the monitoring devices listed above (flow meters, gas analyzer and electricity meters) will be calibrated once a year by a qualified third party. The calibration report will be kept in the archives by the project owner, and checked by CDM manager. When the data is not available from the main monitoring devices, the data measured by the back-up devices, if available, will be used.

Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	Henan BCCY New Power Industry Co., Ltd.
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Salutation	Ms.
Last name	Wang
Middle name	-
First name	Lei
Department	CDM department
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	-

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Appendix 2: Affirmation regarding public funding

No public funding is involved in the PoA, nor in the CPAs.

Appendix 3: Application of methodology(ies)

No further information

Appendix 4: Further background information on ex ante calculation of emission reductions

Provided at CPA level.

Appendix 5: Further background information on the monitoring plan

Provided at CPA level.

History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		