CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

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NOTE:

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

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

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[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

>> "CPA-X: Methane recovery and combustion with renewable energy generation from anaerobic animal manure management systems under the Land Bank of the Philippines' (LBP) Carbon Finance Support Facility"
Version 3, 22/02/2012

CPA Preparation Date
dd/mm/yyyy

A.2. Description of the small-scale CPA:

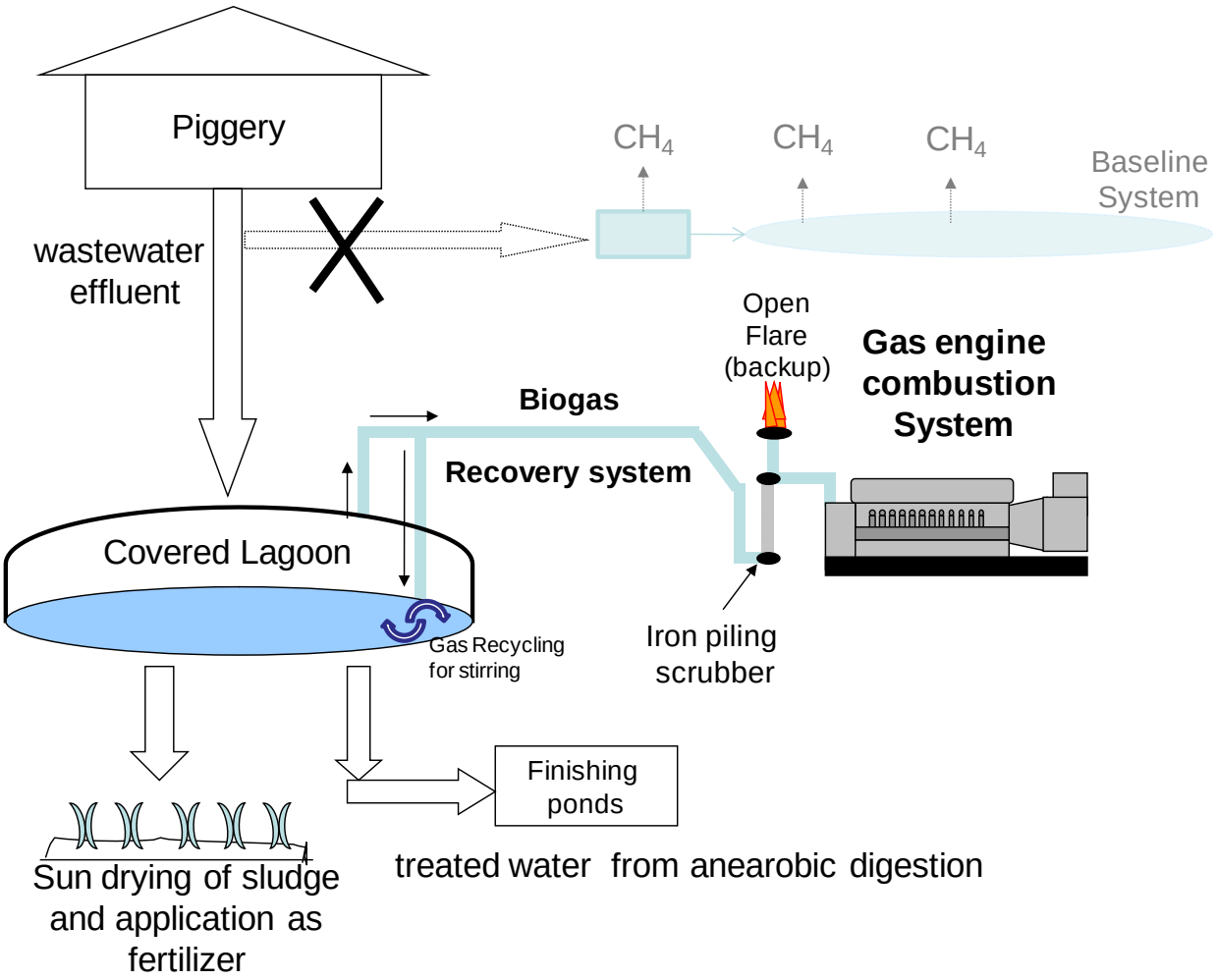
>>
The CPA replaces an open anaerobic manure management system with an anaerobic digestion system with methane recovery and combustion. The project consists of the following:

Anaerobic digestion system: [modify to fit CPA description as necessary]
The waste produced from a piggery will be treated in an enclosed anaerobic system that will prevent the release of methane. The system will consist of a lagoon that is covered by HDPE to collect the biogas and prevent atmospheric gases from leaking into the tank.

Biogas recovery and combustion system: [modify to fit CPA description as necessary]
A system of collection and combustion of the biogas produced by the reactor will also be installed. The system will include a blower system, piping system to collect the gas, a gas filtering system and a gas engine where the gas will be combusted. A backup open flare for combustion of the gas will also be attached into the system when the engine is in use.

Sludge management system: [modify to fit CPA description as necessary]
The treatment system will produce sludge. The sludge will be removed from the biodigester through a pipe, sun dried and applied to soil as fertilizer in a manner that ensures aerobic conditions and avoids methane emissions.

Other components: [modify to fit CPA description as necessary]
After the anaerobic digester, digested wastewater will be discharged to aeration and settling ponds. All power to run the project activity will be provided by the gas engine and as a result no fossil fuel based electricity or other fuel will be used.



[modify diagram to be consistent with CPA description as necessary]

Contribution to sustainable development: [include options and modify as necessary]

1. *Local Environmental Benefits*: The introduction of the covered lagoon reduces odors and provides more operational control than the baseline open lagoon technology. Additionally, the land application of organic fertilizer made from the sludge from the wastewater treatment plant provides nutrient enrichment for nearby crops.

2. *Mobilizing Financing*: Through its Carbon Finance Support Facility (CFSF), LBP will provide additional revenues through carbon finance to _____ Farm.

A.3. Entity/individual responsible for the small-scale CPA:

>> [insert name of proponent of CPA], is the proponent of this CPA.

A.4. Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

>>

A.4.1.1. Host Party:

>> Republic of the Philippines

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

>>

[provide GPS coordinates for piggery] Latitude: X.XX Longitude: XXX.XXX

[provide map of the Philippines, map of province and vicinity map of piggery]

Figure A.1 : Map and situation of _____ in the archipelago of the Philippines

Figure A.2: Vicinity Map of _____.

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

>> dd/mm/yyyy [insert starting date of CPA]

A.4.2.2. Expected operational lifetime of the small-scale CPA:

>> [insert expected operational lifetime]

A.4.3. Choice of the crediting period and related information:

Renewable crediting period; ~~or~~

A.4.3.1. Starting date of the crediting period:

>> DD/MM/YYYY [insert expected inclusion date of CPA]

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

>> 7 years

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

>>

The estimated amount of emission reduction was calculated from the equations described in the PoA related to this CPA. Ex-ante estimation of the emissions reductions are listed in the table below for the first crediting period of seven years:

Year	Methane Recovery Annual estimation of emissions reductions in tons of CO_2	Electricity Generation Annual estimation of emissions reductions in tons of CO_2	Total Annual estimation of emissions reductions in tons of CO_2
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			
Year 7			
Total estimated reductions (tons of CO_2)			
Total number of crediting years	7 years	7 years	7 years
Annual average over the crediting period of estimated reductions (tons of CO_2)			

* The first year, starts by the expected date of inclusion under the PoA, therefore year 1 starts on XX , and the crediting period ends seven years after.

A.4.5. Public funding of the CPA:

>> There is no public funding involved in the CPA. [modify as needed]

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

>>

The proposed CPA is not a de-bundled component of a large project activity as the activity implementer, _____, has not registered or applied to register another small-scale CPA of any PoA, and has not registered a CDM project activity. [verify as part of CPA preparation]

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

>>This is confirmed in an official letter from the project implementer. [obtain letter for each activity]

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

>> "Methane recovery and combustion with renewable energy generation from anaerobic animal manure management systems under Land Bank of the Philippines' (LBP) Carbon Finance Support Facility"

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

The small scale CPA is eligible under the registered PoA as it complies with the criteria defined by LBP

Criteria	Reference of the documentation of the compliance of Marcella CPA	Reference
Project Baseline		
LBP CFSF Reply Form with confirmation statement by the farm owner, indicating that the CPA is not a component of another CDM programme, has not been registered as a project activity of another CDM project,is undergoing validation within another CDM project, nor is a debundled component of a large scale project activity.	Signed CFSF Reply Form by the CPA Implementer has been documented. [obtain signed CFSF Reply Form for each activity]	As per PoA Guidelines
Piggery farm from livestock populations managed under confined conditions.	Yes- the piggery did and continues to be managed under confined conditions. [verify as part of CPA preparation]	As per AMS III.D, para 1.
Piggery farm where manure or the streams obtained after treatment is not discharged into natural water resources (e.g. rivers and estuaries).	Yes- The effluent was stored in an on-site pond with no discharge into natural water resources. [verify as part of CPA preparation]	As per AMS III.D, para 1.
Annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C	Yes- The Philippines has a mean annual temperature of 26.6^{o}C The difference between the mean annual temperature of the southernmost station in Zamboanga and that of the northermost station in Laoag is insignificant. In other words, there is essentially no difference in the mean annual temperature of places in Luzon, Visayas or Mindanao measured at or near sea level. (www.weather.gov.ph) Hence _____ has an average annual temperature above 5 ^{o}C	As per AMS III.D, para 1.
For anaerobic treatment systems in the baseline, the retention time of manure waste must be greater than 1 month.	Yes—_____ [verify as part of CPA preparation and describe as per the farms system].	As per AMS III.D para 1.
For anaerobic lagoons in the baseline the depth is at least 1m.	Yes – [describe depth]	As per AMS III. D. para 1.
The baseline system of waste management is an open anaerobic system with no methane	Yes—The baseline system was_____. [describe	As per AMS III.D para 1.

Criteria	Reference of the documentation of the compliance of Marcella CPA	Reference
recovery and destruction by flaring, combustion or gainful use.	baseline]	
Connection to an electricity distribution system that is supplied by at least one fossil fuel generating unit.	Yes- the farm is connected to the _____ electricity grid that is supplied by more than one fossil fuel generating plant.	As per AMS I.F. v2, para 1.
Project Activity		
The project objective is the replacement of existing open lagoons and anaerobic ponds in livestock farms for anaerobic digesters with combustion equipment to destroy methane by utilizing either open or standardized enclosed stainless steel flares, sized to handle the generated biogas design volume to ensure high combustion efficiency, and/or use of the recovered methane for electricity generation with gas engines.	Yes- The project will replace the open anaerobic lagoon with an anaerobic that will collect methane and destroy it through combustion in a gas engine and stainless steel flare sized to handle the excess gas generated that is not used by the electricity generator.. [verify as part of CPA preparation]	As per AMS III.D para 1.
The sludge is handled aerobically, and final application is made in proper conditions (i.e.,not resulting in methane emissions).	Yes- Sludge will be handled under aerobic conditions. It will be collected from the digester, sun dried and applied aerobically as organic fertilizer. [modify for specific CPA]	As per AMS III.D para 2.
Technical measures are used (e.g. flared, combusted) to ensure that all biogas produced by the digester is utilized and flared.	Yes- Methane recovered will be combusted in an engine or flared. [confirm as part of CPA preparation]	As per AMS III.D, para 2.
The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester.	Yes- [describe manure removal] It does not exceed 45 days.	As per AMS III.D, para 2.
New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the .General Guidelines to SSC CDM methodologies.	The project [does/not] involve a new facility, [fill out with details on facility and how it complies with the related and relevant requirements in the General Guidelines to SSC CDM methodologies if it is a Greenfield project]	As per AMS III.D, para 5.
The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the General Guidelines to SSC CDM methodologies.	For this CPA no equipment is being replaced, therefore this does not apply.	As per AMS III.D, para 6.

Criteria	Reference of the documentation of the compliance of Marcella CPA	Reference
All type III components result in emission reductions less than or equal to 60,000 tCO2-e/yr.	The maximum ERs in a given year are estimated to be XX,XXX tCO2-e/yr which is less than 60,000 tCO2-e/yr	As per AMS III.D, para 7.
Renewable electricity generation from the recovered methane emissions with a maximum output capacity of 15MW.	The maximum output capacity is XXX.	As per AMS I.F. v2 para 2
The maximum capacity of the renewable energy component (in cases where it is a combination of renewable and non-renewable) is 15MW	[Fill out per CPA]	As per AMS I.F. v2 para 9
Installation of additional generation units utilizing the recovered methane emissions at an existing renewable energy facility provided that the added capacity of the project should be lower than or equal to 15 MW and is physically distinct[3] from the existing units.	[Fill out per CPA]	As per AMS I.F. v2 para 7
Retrofitting or modification of an existing electricity generation facility to utilize the recovered methane emissions as fuel with the total output of the modified or retrofitted generating unit not exceeding 15 MW and with the facility having a minimum of 3 years operational data prior to implementation.	[Fill out per CPA]	As per AMS I.F. v2 para 8
Additionality		
The farm is operating an open anaerobic wastewater system in the baseline and the project technology involves higher costs of installation and operation to the farm owner coupled with higher technical requirements for construction, operation and maintenance than continued operation of the open system. Hence this shall be demonstrated through: 1- Project technology involves the installation of a biogas collection and flare/use system 2- Project needs to be financed with future carbon revenues, used as	See section B.3. 1. Evidence has been documented by LBP on site visit and provided by CPA implementer to demonstrate that the project design comprises a biogas collection system (and therefore higher technical requirements than settling ponds or lagoons) and 2. A confirmation from [name of bank] who is the financial institution providing the loan, where future carbon revenues have been presented	As per Attachment A of Appendix B of the simplified modalities and procedures for CDM small scale activities and Sections E.5.1 and E.5.2 of PoA-DD.

[3] Physically distinct units are those that are capable of generating electricity without the operation of existing units and that do not directly affect the mechanical, thermal or electrical characteristics of the existing facility.

Criteria	Reference of the documentation of the compliance of Marcella CPA	Reference
securities to repay the loan.	for the loan evaluation and are partial security to repay the loan. [confirm as part of CPA preparation]	
The farm is compliant with the applicable Philippine environmental rules and regulations	Yes - Copy of the environmental compliance certificate (ECC) has been provided [obtain copy]	
Requirement to be part of the programme		
After all the above conditions have been met and documented, the project proponent must have signed an MOA with LBP to be in a CPA in this program.	Yes- MOA between LBP and _____ farms has been signed	
Emission reductions claimed under the CPA are those derived only from gas use for electricity generation and/or flared. No credits shall be claimed for any other uses of the gas.	Documented as per project design	
Environmental and Social Issues		
The project must have undertaken a stakeholder consultation as outlined in Section D.	Yes—This was completed, see details in Section D. [completed as part of CPA preparation]	Stakeholder consultation done at the CPA level.

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

>>

Additionality has been determined at the PoA level, and the project activity meets the specified requirements as listed in the PoA. These, also referenced on section B.2 above, are detailed below:

Criteria	Analysis/evidence
The farm is operating an open anaerobic wastewater system in the baseline and the project technology involves higher costs of installation and operation to the farm owner coupled with higher technical requirements for construction, operation and maintenance than continued operation of the open system. Hence this shall be demonstrated through: 1- Project technology involves the installation of a biogas collection and flare/use system 2- Project needs to be financed with future carbon revenues, used as securities to repay the loan.	Documented evidence on site visit and provided by CPA implementer: 1. Documented evidence on site visit and provided by (Farm) has been submitted to demonstrate that a biogas collection system will be implemented (and therefore higher technical requirements than settling ponds or lagoons), and the necessary construction, operation and maintenance requirements of the technology used in the project activity have been identified and documented below. 2. Confirmation from (financial institution providing the loan) has been provided, where future carbon revenues have been presented for the loan evaluation, and have

	been considered as partial security to repay the loan.
The farm is compliant with the applicable Philippine environmental rules and regulations	Environmental Compliance Certificate (ECC) has been provided (add any additional permit required)

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

>> The spatial extent of the project boundary encompasses the physical and geographical site of the methane recovery facility and of the renewable generation unit. In terms of GHG emissions, the project is limited to CH_4 emissions from leakage, and CO2 and CH_4 from the gas combustion engine or flare. As the project activity includes the generation of renewable energy and does not include many electrical appliances except for blowers of minimal electricity consumption that is to be supplied by the system itself, the anthropogenic emission from use of fossil fuel based electricity is considered to be zero.

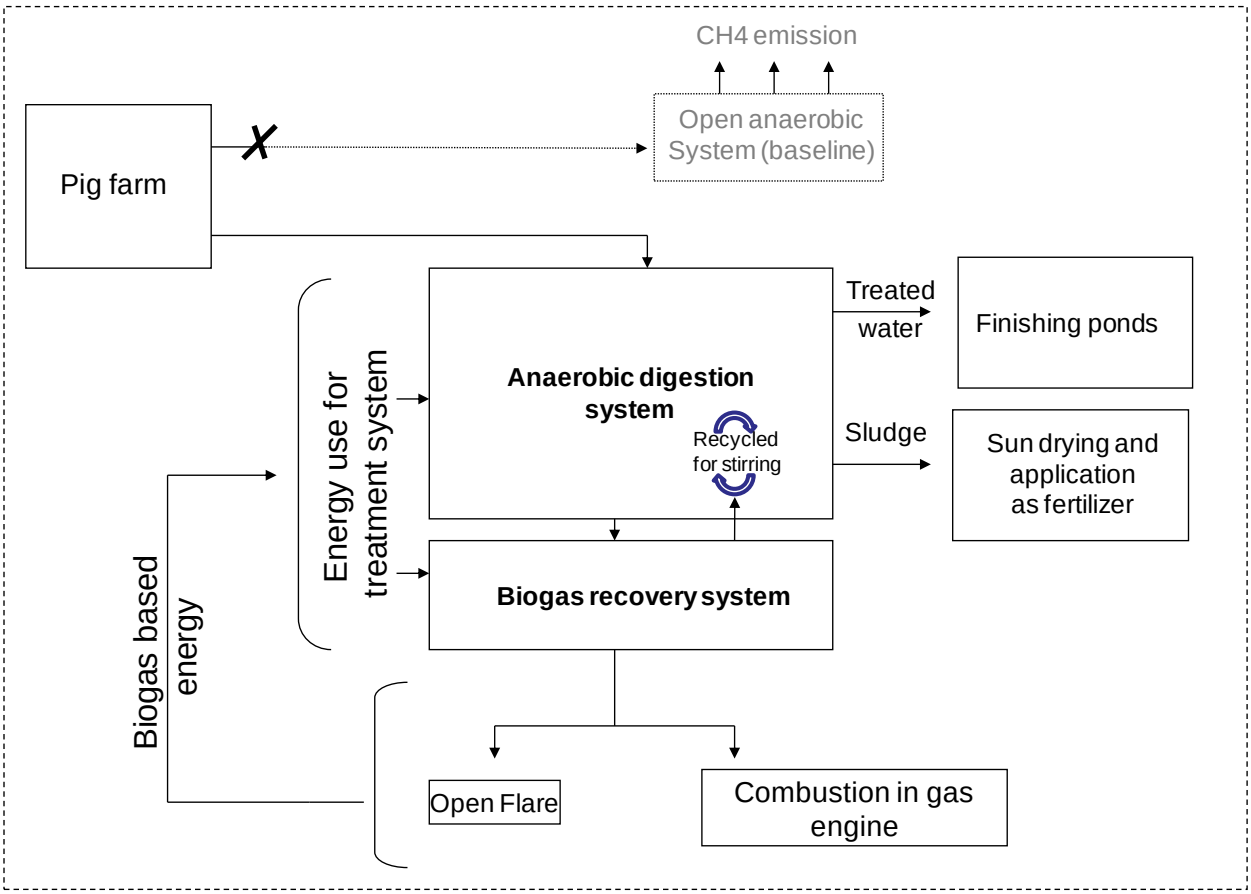
In line with AMS III.D, the following sources and gases are included in the project boundary:

	Source	Gas		Justification / Explanation
Baseline	Anaerobic digestion in the open lagoons	CO_2	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification. This is conservative.
		CH_4	Included	The major source of emissions in the baseline..
	Emissions from Electricity consumption from the Grid	CO_2	Excluded	Excluded for simplification. This is conservative.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from heat generation	CO_2	Excluded	Excluded for simplification. This is conservative
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	On-site fossil electricity or fuel use due to the project activity	CO_2	Excluded/ Included	It will be [excluded/included] since it has been demonstrated by the CPA that the level of anthropogenic emissions from use o fossil fuel for electricity use can be considered [negligible/ significant].
		CH_4	Excluded	Excluded for simplification. Emissions assumed to be very small.
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.
	Physical leakage	CO_2	Excluded	Excluded for simplification. Emissions assumed to be very small.
		CH_4	Included	Estimated with conservative assumptions based on AMS III.D.
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.

	Flaring	CO_2	Included	Calculated with the flaring gas tool.
		CH_4	Included	Calculated with the flaring gas tool.
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.

In line with AMS I.F, the following sources and gases are included in the project boundary:

	Source	**Gas**		**Justification / Explanation**
Baseline	Emissions from Electricity consumption from the Grid	CO_2	Included	The major source of emissions in the baseline.
Project activity	On-site fossil electricity or fuel use due to the project activity	CO_2	Excluded	Engine used will not require fossil fuel and/or fossil fuel based electricity during start-up or at any stage of generation.
		N_2O	Excluded	Excluded for simplification. This is conservative.
		CH_4	Excluded	Excluded for simplification. This is conservative.



Project Boundary

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B.5. Emission reductions:

The emissions reductions were estimated ex-ante using the equations and procedures outlined in the PoA-DD. These parameters were optimized to the situation of the _____ CPA. In particular:

Use of sequential manure management systems: _____ farm manure management system will not be sequential and therefore no special calculation (using RVS) for treatment stages is necessary. [determined as part of CPA preparation]

Emissions from power: The calculation of the emissions from power will depend on the source of energy used in powering the system. In this case, [all/some] power used in the project activity will come from the biogas fuel produced by the project activity and therefore it is not necessary to calculate electricity use ($EL_{pr,y}$) or fuel use by the project activity.($FL_{pr,y}$) or use the associated emissions factors (EF_{fuel}, EF_{elec}) to do so.

Use of Annex I country VS and Bo: _____ [will/not] use VS and Bo values from Annex I countries and therefore the genetic source of the livestock [will/ not] need to be monitored.

Adjustment of VS for site specific animal weight: The default VS [will] or [will not] be adjusted for site specific animal weight.

Operating Margin Methodology: The Simple OM approach is used since low-cost / must run energy resources in the _____ electricity grid constitute only _____ of the total grid connected generated electricity, way below the _____ threshold; while data for Dispatch Analysis is not publicly available. [determined as part of CPA preparation]

B.5.1. Data and parameters that are available at validation:

>>

Data / Parameter:	$\mathbf{W_{site}}$
Data unit:	Kg
Description:	Average site animal weight for defined population (market and breeding)
Source of data used:	_____ farm data recording system.
Value applied:	XX for market; XX for breeding
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used for calculating $VS_{LT,y}$ adjusted for animal weight. Based on average weight of breeding and market pigs based on the pig census for ____ farm. See Annex 3 for pig census data.
Any comment:	--

Data / Parameter:	$\mathbf{W_{default}}$
Data unit:	Kg.
Description:	Default animal weight for defined population (market and breeding).
Source of data used:	IPCC default Tables 10 A-7 & A-8 of IPCC 2006 Emissions from livestock and manure management.
Value applied:	XX for market; XX for breeding.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on [region] breeds as justified under the methodology and described in this section under the parameters $\mathbf{B_{o,LT}}$ and $\mathbf{VS_{LT,y}}$.
Any comment:	--

Data / Parameter:	$\mathbf{N_{da,y}}$
Data unit:	Days
Description:	Number of days animal is alive in the farm in the year "y"
Source of data used:	Based on farm records and estimates.

Value applied:	XX days for market sold; XX for breeders
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used in the calculation of $N_{LT,y}$ as per AMS III.D.
Any comment:	--

Data / Parameter:	**$N_{LT,y}$**
Data unit:	Number
Description:	Number of animals produced annually of type "LT" for the year "y"
Source of data used:	Based on farm records adjusted for number of days the animal is alive using calculations at per AMS III.D.
Value applied:	N breed XXX N market -sold XXX
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on actual farm data and calculated using formulas from AMS III.D as outlined in Section B.5.2.
Any comment:	--

Data / Parameter:	**MCF_j**
Data unit:	Fraction
Description:	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data used:	Table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10, "Uncovered Anaerobic Lagoon"
Value applied:	XX
Justification of the choice of data or description of measurement methods and procedures actually applied :	Corresponds to 'uncovered anaerobic lagoon' manure management systems with a mean annual temperature of greater than 26°C. According to the Philippine Atmospheric Geophysical & Astronomical Services Administration (PAGASA[4]), the average of all weather stations in ____ , where the project is located, the mean annual temperature is >26°C.
Any comment:	--

Data / Parameter:	**$B_{o,LT}$**
Data unit:	m^3 CH4/kg dm
Description:	Maximum methane producing potential of the volatile solid generated for

[4] For details and record of annual mean temperature http://kidlat.pagasa.dost.gov.ph/cab/stats2.htm

	animal type "LT".
Source of data used:	The genetic source of the production operations livestock originates from an Annex I country, and the CPA will use default values corresponding to Annex I species found in Table 10A-7 (market animals) & 10A-8 (breeding animals) of IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, Chapter 10.
Value applied:	$B_{o,breed}$ = XX ; $B_{o,market}$ = XX
Justification of the choice of data or description of measurement methods and procedures actually applied :	The use of Annex I species defaults for VS is justified based on the requirements of AMS III.D as follows: (i) _____ farms uses uses formulated feed rations (FFR) which are optimized for the various stages of animal growth, category, weight gain, productivity and genetics evidence of which is available for review by the DOE. (ii) The project's specified animal weight (XX kg for market pigs and XX kg for breeding pigs) is more similar to developed country IPCC default values (XX kg for market and XX kg for breeding) than to Asian default values (28 kg for market and breeding).
Any comment:	--

Data / Parameter:	**$VS_{LT,y}$**
Data unit:	Kg dm/animal/year
Description:	Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year).
Source of data used:	(i) Default values: The genetic source of the production operations livestock originates from an [Annex I] or [non Annex 1] country, and the CPA will use default values corresponding to [Annex I] or [non Annex 1] species found in Table XX (market animals) & XX (breeding animals) of IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, Chapter 10. (ii) Adjustment for animal weight: VS [is] or [is not] adjusted for animal weight according to the calculations outlined in AMS III.D and show in section B.5.2.
Value applied:	$VS_{,breed}$ = XX; $VS_{,market\ ,\ sold}$= XX;
Justification of the choice of data or description of measurement methods and procedures actually applied :	The use of Annex I species defaults for VS is justified based on the requirements of AMS III.D as follows: (i) ____ farms uses uses formulated feed rations (FFR) which are optimized for the various stages of animal growth, category, weight gain, productivity and genetics evidence of which is available for review by the DOE (ii) The project's specified animal weight (XX kg for market pigs and XX kg for breeding pigs) is more similar to developed country IPCC default values (XX kg for market and XX kg for breeding) than to Asian default values (28 kg for market and breeding).
Any comment:	Calculations are shown in Section B.5.2.

Data / Parameter:	**$\eta_{flare,h}$**

Data unit:	%
Description:	Flare efficiency
Source of data used:	Based on defaults provided in AMS III.D and "Tool for calculation of emissions from flaring gases containing methane"
Value applied:	90%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default corresponds to that of an enclosed flare. The ____ CPA will use a gas combustion engine to combust the biogas which under the definitions of the "Tool for calculation of emissions from flaring gases containing methane" is an enclosed flare and from an efficiency perspective operates in a similar manner.
Any comment:	--

Data / Parameter:	**D CH_4**
Data unit:	t/m3
Description:	Density of the methane
Source of data used:	Specified in AMS. III.D
Value applied:	0.00067
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value at standard temperature (20 ^{o}C) and pressure (1 atm).
Any comment:	--

Data / Parameter:	**GWP $_{CH4}$**
Data unit:	tCO_2-e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	Specified in AMS. III.D
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methodology.
Any comment:	--

Data / Parameter:	**$MS\%_{Bl,j}$**
Data unit:	Fraction
Description:	Fraction of manure handled in the baseline animal manure management system

	"j"
Source of data used:	Based on baseline system operation.
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	All manure was treated in the open lagoons.
Any comment:	--

Data / Parameter:	**$W_{CH4,y}$**
Data unit:	mass fraction
Description:	Methane content in biogas in year "y"
Source of data used:	Based on options provided in AMS III D v16
Value applied:	60%
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methodology.
Any comment:	--

Data / Parameter:	**UF_b**
Data unit:	Fraction
Description:	Model correction factor to account for model uncertainties.
Source of data used:	Default value as per AMS III.D
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used in the calculation of $BE_{,y}$ as per AMS III.D.
Any comment:	--

Data / Parameter:	**$n_{d,y}$**
Data unit:	Days
Description:	Number of days in year "y" where the treatment plant is operational.
Source of data used:	Based on project design.
Value applied:	XXX [insert based on CPA design]
Justification of the	Used in calculating $VS_{LT,y}$ adjusted for animal weight and PEflare,y.

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

Data / Parameter:	**$TM_{RG,h.}$**
Data unit:	Kg/h
Description:	Mass flow rate of methane in residual gas in hour h.
Source of data used:	Based on the projected residual gas that would be combusted under the project activity.
Value applied:	XX
Justification of the choice of data or description of measurement methods and procedures actually applied :	$TM_{RG,h}$ was estimated based on the projected baseline methane production (see calculations of BEy in section B.5.2) assuming similar conditions as the baseline lagoon as in the project and subtracting the estimated physical leakage of methane in the project (see calculations of $PE_{PL,y}$ in section B.5.2).
Any comment:	--

Data / Parameter:	**EGy**
Data unit:	MWh
Description:	Net quantity of electricity estimated to be generated in the project plant during the year y
Source of data used:	Estimated based on project design and as outlined in this PoA-DD
Value applied:	XX
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on requirements of AMS I.F and dependent on the particulars f the CPA; whether addition on capacity, retrofit, or otherwise as per AMS I.F.
Any comment:	--

Data / Parameter:	**$EF_{OM,y}$ and $EF_{BM,y}$**
Data unit:	Kg CO_2 / kWh
Description:	Factor of emissions of the Philippines electricity grid (Luzon-Visayas or Mindanao or other small grid as may be the case)
Source of data used:	Calculated according to CDM guidelines and data from the Philippines Department of Energy (DOE). See http://cdmdna.emb.gov.ph and Annex 3 of this document for complete details
Value applied:	0.5416
Justification of the	Combined margin (including inter-regional and cross-border electricity

choice of data or description of measurement methods and procedures actually applied :	transfers) calculated according to the "Tool to calculate the emission factor for an electricity system", version 2. Fuel consumption and electricity generation data for plants connected to the grid, provided by Philippine Official Statistics of the DOE (Department of Energy).
Any comment:	CEF_ is calculated as a weighted sum of the OM and BM emission factors

Data / Parameter:	**Information on plants used in calculating OM and BM**
Data unit:	--
Description:	Identification of basic information for power plants for the OM and BM
Source of data used:	Department of Energy published information
Value applied:	The following information will be presented for each plant. 1. Plant name; 2. Date of commissioning; 3. Capacity (MW; 4. Fuel type(s) used; 5. In cases where the simple OM or the simple adjusted OM is used, information on whether the plant or unit is low cost must run; 6. Identification of whether the plant is used for the build margin or operating margin calculation;
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on requirements of "Tool to calculate the emission factor for an electricity system", version 2.
Any comment:	Identification of plants to calculate OM and BM

Data / Parameter:	**$EG_{m,y}$,EG_{y} ,$EG_{j,y}$, $EG_{k,y}$, and $EG_{n,h}$**
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit m,j,k or n (or in the project electricity system in case of EGy) in year y or hour h.
Source of data used:	Government data using most recent three historical years for which data is available at the time of submission of the CPA-DD to the DOE for inclusion in the PoA.
Value applied:	This will be provided for all plants used in the calculation of OM and BM for the individual CPA.
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per requirements of "Tool to calculate the emission factor for an electricity system", version 2
Any comment:	--

Data / Parameter:	**$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,j,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ and $FC_{i,n,h}$**
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by a power plant per unit m,j,k or n (or in the project electricity system in case of FCi,y) in year y or hour h.
Source of data used:	Calculated using government data from the most recent three historical years for which data is available at the time of submission of the CPA-DD to the DOE.
Value applied:	--
Justification of the choice of data or description of measurement methods and procedures actually applied :	Will be reported for all power plants used to calculate the OM and BM and will be used in the ex-ante calculation methods for determining the OM and BM based on the "Tool to calculate the emission factor for an electricity system", version 2. Note that the methods to be applied to CPAs under the PoA are only those that can be applied ex-ante (Simple OM, simple adjusted OM, average OM and ex-ante BM).
Any comment:	Since data of the amount of fuel i (in a mass or volume unit) consumed by relevant power sources are not available for all power plants in the Philippines, it is reliably estimated with the PFR per MWh formula: 3.6*10^9/(NEC*10^12)=TJ, where the NECs are the actual ones of each power plant as provided in the most recent DOE Annual Statistics. Parameter 5 should be monitored using the most recent information published by the NEC. This parameter is included in the COEF calculation

Data / Parameter:	**NCVi,y**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type I in year y
Source of data used:	The following data sources may be used if the relevant conditions apply:

Data source	Conditions for using the data source
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g, utilities).
Regional or national average default values.	If values are reliable and documented in regional or national energy statistics /energy balances.
IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	

Value applied:	Specific for each CPA.
Justification of the choice of data or	Calculated using government data from the most recent three historical years for which data is available at the time of submission of the CPA-DD to the

description of measurement methods and procedures actually applied :	DOE.
Any comment:	The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. In these cases a gross calorific value will also be used as a basis for the CO_2 emission factor.

Data / Parameter:	**$EF_{CO2i,y}$ and $EF_{CO2,m,i,y}$**
Data unit:	tCO_2/GJ
Description:	CO2 emission factor of fossil fuel type i in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1, Table 1.4, Pages 1.23 and 1.24, for conservativeness lower limit of the 95% confidence interval for the default factor has been applied.
Value applied:	Natural Gas: 0.0543 Diesel: 0.0726 Residual Fuel Oil: 0.0755 Coal: 0.0873
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methodology, since values from power plant operators are not available, and there is not reliable data at the regional or national level, then for conservativeness the lower limit of the 95% confidence interval for the default IPCC value is considered.
Any comment:	This is used to determine the grid emission factor.

Data / Parameter:	**$\eta_{m,y}$**
Data unit:	--
Description:	Average net energy conversion efficiency of power unit m in year y
Source of data used:	Use either: • Documented manufacturer's specification (if the efficiency of the plant is not significantly increased through retrofits or rehabilitations); • Data from the utility, the dispatch center or official records if it can be deemed reliable; or • Default values below.
Value applied:	Default values

	Old (before 2000)	New (after 2000)
Coal		
- Subcritical	37%	39%
- Supercritical		45%
- Utrasupercritical		50%
IGCC		50%
FBS	35.5%	
CFBS	36.5%	40%

	PFBS		41.5%
	Oil		
	- Steam turbine	37.5%	39%
	- Open cycle	30%	39.5%
	Combined cycle	46%	46%
	Natural gas		
	-Steam turbine	37.5%	37.5%
	-Open cycle	30%	39.5%
	Combined cycle	46%	60%
	From Annex I of "Tool to calculate the emission factor for an electricity system", version 2.		
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on the "Tool to calculate the emission factor for an electricity system", version 2.		
Any comment:	--		

B.5.2. Ex-ante calculation of emission reductions:

>>

Ex ante emission reductions of the project activity were calculated using the following formula:

$$PER_y = MER_y + GER_y$$

Where

MER_y Emission reduction in year "y" (tCO_2-e) from methane recovery (as per AMS III.D)
GER_y Emission reduction in year "y" (tCO_2-e) from renewable electricity generation (as per AMS I.F)

Ex ante emissions from methane recovery were calculated using the following formula:

$$MERy = MBEy - (MPEy + MLeakagey)$$

Where

MERy Emission reduction in year "y" (tCO_2-e)
MBEy Baseline emissions in year "y" (tCO_2-e)
MPEy Project emissions in year "y" (tCO_2-e)

MLeakagey Project leakage in year "y" (tCO_2-e)

Baseline emissions (MBEy), project emissions (MPEy) and leakage (MLeakagey) were calculated based on AMS III D as shown below:

Baseline Emissions (MBEy)

Baseline emissions are calculated using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity. The following formula was used:

MBEy = *GWPCH4 * DCH4 * Ufb* * ∑j,LT *MCFj * B0,LT * NLT,y * VSLT,y * MS%Bl, j*

where:

MBEy	baseline emissions in year "y" (tCO2-e/yr)
GWPCH4	Global Warming Potential (GWP) of CH4 (21)
DCH4	CH4 density (0.00067 t/m3 at room temperature (20 ºC) and 1 atm pressure).
LT	Index for all types of livestock
j	Index for animal waste management system
MCFj	Annual methane conversion factor (MCF) for the baseline animal waste management system "j" in percentages (digester in project scenario).
B0,LT	Maximum methane producing potential of the volatile solid generated for animal type "LT" (m3 CH4/kg dm)
NLT,y	Annual average number of animals of type "LT" in year "y" (numbers) calculated using the formula below.
VSLT,y	Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)
MS%Bl, j	Fraction of manure handled in baseline animal manure management system "j"
UFb	Model correction factor to account for model uncertainties (0.94)

Annual average animal population (*NLT,y*) for breeding and market pigs is determined from actual pig census for _____ farm:

Population projections (based on 20XX populations)

Breeding Swine				**Market Swine**	
Sow		Boar		Finisher	
average population	average weight	average population	average weight	average population	average weight
XX	XX	XX	XX	XX	XX

Calculation of VS: VS are calculated by adjusting default VS using site specific animal weights as follows:

$VS_{site,LT,y} = (W_{site} / W_{default}) \times VS_{default} * nd_y$

where:

$VS_{site, LT,y}$	Adjusted volatile solid excretion for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)
W_{site}	Average site animal weight for defined population, in kg.
$W_{default}$	Default average animal weight for defined population, in kg.
$VS_{default}$	Default value (IPCC) for the volatile solid excretion per day on a dry- matter basis for defined livestock population, in kg-dm/animal/year
nd_y	Number of days in year "y" where the treatment plant was operational

Parameter	**W_{site}**	**$W_{default}$**	**$VS_{default}$**	**nd_y**	**Calculated value (VS LT,y)**	**Comments**
VS breed,y	XX	XX	XX	XX	XX	
VS market-sold,y	XX	XX	XX	XX	XX	

Summary of Calculation of Annual Baseline Emissions: Summarized below are the constants and outcome of the calculation from the formula above for MBEy. All constants are the same for each year; therefore the annual emission reductions are estimated to be the same throughout the crediting period.

Parameter	**Value**
$GWPCH_4$	21
DCH_4	0.00067
Ufb	0.94
MCFj	XX
Bo breed,y	XX
Bo market,y	XX
VS breed,y	XX
VS market,y	XX
N breed,y	XX
N market sold, y	XX
MS%Bl, j	XX
MBEy	**_____ tCO2-e/yr**

Project Emissions (MPE_y)

Project emissions are calculated using the following formula:

MPEy = PEPL,,y + PEflare,y + PEpower,y

Where:

MPEy Project emissions in year "y" (tCO2e)
PEPL,y Emissions due to physical leakage of biogas in year "y" (tCO2e)
PEflare,y Emissions from flaring or combustion of the biogas stream in the year "y" (tCO2e)
PEpower,y Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year "y" (tCO2e)

Emissions due to physical leakage (PEPL,y) are estimated as per AMS III.D as 10% of: the maximum methane producing potential of the manure fed into the management systems implemented by the project activity. As the ___ farm system is not a sequential treatment system no adjustment (RVS) is necessary to account for sequential stages.

$PE_{PL,y}$ = 0.10 * *GWPCH4 * DCH4 * ∑j,LT B0,LT * NLT,y * VSLT,y * MS%i, j*

Parameter	**value**
GWP_{CH4}	21
D_{CH4}	0.00067
Bo breed,y	XX
Bo market,y	XX
VS breed,y	XX
VS market,y	XX
N breed,y	XX
N market sold, y	XX
MS%Bl, j	XX
$MPE_{PL,y}$ (2010-2016)	**_____ tCO2-e/yr**

Emissions due to flaring or combustion (PEflare,y) The ____ farm system will flare gas when the energy generator is not in use. The ex-ante project emissions are calculated using the calculated amount of gas that will be sent to the flare during downtime of the energy generator. Ex-post, these will be calculated using the 'Tool to determine project emissions from flaring gases containing methane' (EB28) through the following formula:

$PE_{flare} = \Sigma\ TM_{RG,h} * (1 - \square_{flare,\ h}) * GWPCH_4 / 1000$

Where:

TMRG,h is the mass flow rate of methane in residual gas in hour h in kg/h which is summed over the hours per year of operation.
□□*flare, h is the* flare efficiency in hour h
GWP_{CH4} is the GWP of methane according to IPCC.

Emission for power use ($PE_{power,y}$) is zero as ___ farm relies on no electricity or fuel for the operation of the facility. The power is derived from the biogas system which emits no greenhouse gases relative to the baseline. [documented as part of CPA preparation]

*Total project emissions (M**PEy**)*

Parameter	Value
PEPL,,y	XX
PEflare,y	XX
$PE_{power,y}$	XX
MPEy	**_____tCO2-e/yr**

Leakage *(MLeakage$_y$)*
The _____ CPA [does/not] involve replacement of equipment and therefore leakage is ___.

The total annual emission reduction from methane recovery is estimated as:

MERy = MBEy - (MPEy + MLeakagey)
MERy = XX tCO2-e/yr - (XX tCO2-e/yr + 0)
MERy = XX tCO2-e/yr

Ex ante emissions from renewable electricity generation are calculated using the following formula:

GER_y = GBEy - (GPEy + GLeakagey)

Where
GERy Emission reduction in year "y" (tCO_2-e) from electricity generation
GBEy Baseline emissions in year "y" (tCO_2-e) from renewable electricity generation
GPEy Project emissions in year "y" (tCO_2-e) from renewable electricity generation
GLeakagey Project leakage in year "y" (tCO_2-e) from renewable electricity generation

Baseline emissions (GBEy), project emissions (GPEy) and leakage (GLeakagey) from renewable electricity generation are to be calculated based on AMS I. F as shown below:

Baseline Emissions (GBEy)

Baseline emissions related to the use of the recovered methane for electricity generation that displaces electricity from a fossil fuel based electricity distribution system are equivalent to the amount of electricity (kWh/yr) produced by the project activity multiplied by the emission coefficient (kg CO_2//kWh) of the relevant electrical grid.

$GBEy = (EG_y - EG_{baseline}) * EFy$

Where

GBE_y	Baseline emissions in year y (tCO_2) from renewable electricity generation
EG_y	Electricity generated by the project in year y (MWh/yr)
$EG_{baseline}$	Baseline electricity supplied to the grid in case of modified or retrofit units (MWh/yr)
EF_y	Baseline emissions factor (tCO_2-e/MWh)

Electricity generated by the project (EG_y) where estimated based on the rated capacity of XX kW XX gas engines that will be used for electricity generation utilizing the recovered methane. The engines are assumed to run 24 hours a day, (365-n) days a year, where n is the amount of days that the generator is expected to be on maintenance, for a total of XXXX hours a year at an operating rate of XX%. The total annual amount of electricity displaced from the grid by the project activity is estimated as:

EG_y = XX MW * XX% * X,XXX hours
EG_y = XX MWh / year

Baseline electricity generated ($EG_{baseline}$) is considered ____ as the project [does/not] involve any modification / retrofit or addition to an existing generating facility.

$EG_{baseline}$ = XX MWh

Baseline emissions factor (EFy) are calculated using the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the _Tool to calculate the emission factor for an electricity system'. The electricity system considered is the _____ grid. The Simple OM approach is used since low-cost / must run energy resources in the _____ electricity grid constitute less than 50% of the total grid connected generated electricity; while data for Dispatch Analysis is not publicly available.

EF_y = average (OM_{simple}, BM)
EF_y = XX tCO_2-e/MWh

The total annual baseline emission to be considered in electricity generation is estimated as:

GBEy = (XX MWh - 0 MWh) * XX tCO_2-e/MWh
GBEy = XX tCO_2-e / year

Project emission (GPE_y)

As per methodology AMS III.D. (version 17 paragraph 15), "If recovered methane is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor." Thus when the project activities include the generation of electricity using the recovered methane to power auxiliary equipment i.e. blowers of minimal consumption, electricity generation will be taken into account and zero will be used as its emission factor.

$PE_{power,y} = EG_{AE} * 0$

In the event that there is not enough gas, or for any other reason the energy generator is not operating, the project activity shall monitor the energy consumption from the grid $EC_{PJ,y,}$ and shall consider it as project activity emissions, where the emission factor will be that for the Philippine grid it is connected to. Where:

$PE_{power,y} = EC_{PJ,y} * EF_y$

Leakage(*GLeakagey)*
No leakage calculation is required as per AMS III.D version 17 paragraph 17.

The total annual emission reduction by the generation of electricity from recovered methane that displaces fossil fuel based electricity from the grid is estimated as:

GER_y = GBEy - (GPEy + GLeakagey)
GER_y = XX tCO_2-e - (0 + 0)
GER_y = XX tCO_2-e / year

The total annual emission reduction of the project activity is estimated as:

PER_y = $MER_y + GER_y$
PER_y = XX tCO2-e/yr + XX tCO_2-e/year
PER_y = XX tCO2-e/yr

B.5.3. Summary of the ex-ante estimation of emission reductions:

>>
Emission reduction from methane recovery as per AMS III.D.

Year	**Estimation of baseline emissions (tonnes of CO_2 e)**	**Estimation of project activity emissions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2 e)**	**Estimation of overall emission reductions (tonnes of CO_2 e)**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
Total for crediting period (tonnes of CO_2 e)				

* The first year, starts by the expected date of inclusion under the PoA, therefore the crediting period ends seven years after. For complete details please refer to emission reduction calculation spreadsheet.

Emission reduction from electricity generation as per AMS I.F.

Year	**Estimation of baseline emissions (tonnes of CO_2 e)**	**Estimation of project activity emissions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2 e)**	**Estimation of overall emission reductions (tonnes of CO_2 e)**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
Total for crediting period (tonnes of CO_2 e)				

* The first year, starts by the expected date of inclusion under the PoA, therefore the crediting period ends seven years after. For complete details please refer to emission reduction calculation spreadsheet.

Total Emission Reduction per Year

Year	**Estimation of baseline emissions (tonnes of CO_2 e)**	**Estimation of project activity emissions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2 e)**	**Estimation of overall emission reductions (tonnes of CO_2 e)**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
Total for crediting period (tonnes of CO_2 e)				

* The first year, starts by the expected date of inc;usion under the PoA, therefore the crediting period ends seven years after. For complete details please refer to emission reduction calculation spreadsheet.

B.6. Application of the monitoring methodology and description of the monitoring plan:

B.6.1. Description of the monitoring plan:

>> The approved monitoring methodology follows the "Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories", version 12 and the approved monitoring methodologies for Types III.D.version17, and I.F., version 2.

CPA Operations Plan: _____ farm will develop an operations plan that defines a standard against which the project performance will be measured in terms of its emission reductions (ER) and conformance with all standards and criteria under the PoA. It will assist _____ farms in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to coordinate all the monitoring requirements for generating certified emission reductions from their project and for ensuring compliance with the obligations with LBP under the PoA.

The CPA Operations Plan outlines the following plan:

Monitoring: To be monitored are those parameters described in the tables below which also details the means of measurement and QA/QC procedures. These parameters were optimized to the situation of the _____ CPA. In particular:

Type of flare or combustion system: The type of combustion system affects the default flare efficiency (FE) used as outlined below. _____ will use a gas combustion engine which is an enclosed system except in cases where the engine is not operational during which time a closed flare will be used. _____ will monitor and record the use and compliance with manufacturers specifications for each of the two systems and the appropriate constants will be used as outlined below.

Use of sequential manure management systems: _____ farm manure management system will not be sequential and therefore no special monitoring protocols for treatment stages are necessary.

Type of fuel used: The monitoring of the emissions from power will depend on the source of energy used in powering the system, if any. In this case, all power used in the project activity will come from the biogas fuel produced by the project activity iand therefore it is not necessary to monitor electricity use ($EL_{pr,y}$) or fuel use by the project activity.($FL_{pr,y}$).

Use of Annex I country VS and Bo: _____ will use VS and Bo values from Annex I countries and therefore the genetic source of the livestock will be need to be monitored.

Quality Assurance and Quality Control: The proponent will have a quality assurance and quality control plan in order to ensure that monitoring is done accurately and with properly calibrated instruments. The basic requirements are outlined in the tables below. In particular, scales, methane measurement devices, waste flow measurement devices, biogas flow meters, thermometers, pressure meters and electricity meters will be calibrated as per manufacturer specifications.

Data recording: Proper management processes and systems records will be required by the operator, as the auditors will request copies of such records to judge compliance with the required management systems.

All data recording of the monitored data will include both paper and electronic versions, backup systems and periodic checking for data entry mistakes.

Reporting: Monitoring data will be reported quarterly to LBP along with any major issues related to the monitoring system that may need attention. The estimation of emission reductions and reporting of the data for verification purposes will be done annually by LBP.

Calculation of emissions reductions: Based on the monitoring data the emission reductions will be calculated ex-post using the following approach:

$$PER_y = MER_{y,\ ex\text{-}post} + GER_{y,\ ex\text{-}post}$$

Where

$MER_{y,\ ex\text{-}post}$ Emission reduction in year "y" (tCO^2-e) from methane recovery (as per AMS III.D)
$GER_{y,\ ex\text{-}ost}$ Emission reduction in year "y" (tCO^2-e) from renewable electricity generation (as per AMS I.F)

The emission reductions achieved in any year from methane recovery are the lowest value of the following:

$$MERy,ex\text{-}post = \min [(MBEy,ex\text{-}post - MPEy,ex\text{-}post) , (MDy)]$$

Where:
ERy,ex-post Emission reductions achieved by the project activity based on monitored values for year "y" (tCO2 e)
*BE*y,ex-post Baseline emissions calculated using the formula found in Section E.6.2 using *ex post* monitored values of NLT,y and if applicable VSLT,y
*PE*y,ex-post Project emissions calculated using the formula found in Section E.6.2 using *ex post* monitored values of NLT,y ,MS% i,y and if applicable VSLT,y
MDy Methane captured and destroyed or used gainfully by the project activity in year "y" (tCO2e)

MDy will be measured using the conditions of the flaring process:

$$MDy = BGburnt,y * WCH4,y * DCH4 * FE * GWPCH4$$

Where:
BGburnt,y Biogas flared or combusted in year "y" (m^3).
WCH4,y Methane content in biogas in the year "y" (mass fraction)
FE Flare efficiency in the year "y" (fraction)

Methane content in biogas, $W_{CH4:}$ As per AMS.III.D version 17 there are three options to monitor/determine the fraction of methane in the biogas: a) should be measured with a continuous analyzer or alternatively, b) with periodical measurements at a 90/10 confidence/precision level or, alternatively c) a default value of

60% methane content can be used. For all CPAs under this PoA **option c) will be adopted**: a default value of 60% methane content

Flare efficiency (FE) for all CPAs will be done using default values except in circumstances where it does not operate in accordance with manufacturers specifications for an enclosed flare or fall out of specified temperature range for an open flare (as outlined in AMS III. D and discussed in section E.7.1).

Project emissions are estimated using the equations given in section E.6.2 of the PoA.

The Physical leakage ($PE_{PL,y}$) calculation will be based on monitored parameters of $MS\%i,y$, $N_{LT,y}$, $VS_{LT,y}$ and RVS. It is not necessary to monitor the flare efficiency as the default value is used for all CPAs and none will undertake continuous monitoring of the efficiency; $PE_{flare,y}$ will be calculated using this default flare efficiency value. For $PE_{power,y}$ as per the methodology methane used to power auxiliary equipment of the project (EG_{AE}) will be taken into account accordingly, using zero as its emission factor.

The emission reductions achieved in any year from from renewable electricity generation are the following:

$$GBE_{y,ex\text{-}post} = (EG_{y,\ ex\text{-}post} - EG_{baseline}) * EF_{y,ex\text{-}ante}$$

Where

$GBE_{y,\ ex\text{-}post}$	Baseline emissions based on monitored values for year "y" (tCO2) from renewable electricity generation
$EG_{y,ex\text{-}post}$	Electricity generated based on monitored values and calculated using the formula found in Section E.6.2 for year "y" (MWh/yr)
$EG_{baseline}$	Baseline electricity supplied to the grid in case of modified or retrofit units based on monitored values and calculated using the formula found in Section E.6.2
$EF_{y,ex\text{-}ante}$	Baseline emissions factor calculated using the formula found in Section E.6.2 (tCO2-e/MWh) *ex-ante* values applied throughout the crediting period

Parameters to be Monitored under the CPA:

Data / Parameter:	**$BG_{burnt,y}$**
Data unit:	Nm^3
Description:	Biogas flared or combusted in year "y"
Source of data to be used:	flow meters on site
Description of measurement methods and procedures to be applied:	Measurements can be on a wet or dry basis but done consistently and on the same basis as the methane content of the biogas ($W_{CH4,y}$). Flow meters will measure continuously the volume of gas subject to combustion and will be added over a period of a year to get the annual measurement. Temperature and pressure will be measured simultaneously to normalize for the conditions of the gas combusted.
QA/QC procedures to be applied:	Flow meters shall be subject to regular maintenance, testing and calibration.
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**FE**

Data unit:	Fraction
Description:	Flare efficiency in the year "y"
Source of data to be used:	Default will be used except in circumstances where it does not operate in accordance with manufacturers specifications for the gas combustion engine or fall out of specified temperature range for the backup open flare (as discussed below).
Description of measurement methods and procedures to be applied:	Gas combustion engine: 0.9 when operated in accordance with manufacturers specifications. 0.5 during any hour where it does not operate in accordance with manufacturers specifications. Backup Open flare: 0.5 when operated above 500°C 0 when operated below 500°C Monitoring of compliance with manufacturers specifications (enclosed flares) and temperature (open flare) as shown below.
QA/QC procedures to be applied:	Standard quality checking of data logging and recording.
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	$\mathbf{T_{flare}}$
Data unit:	^{o}C
Description:	Temperature in the exhaust gas of the flare.
Source of data to be used:	Measurements by farm owners.
Description of measurement methods and procedures to be applied:	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. Measured continuously. Temperature will be used to compare against manufacturers specifications (for gas combustion engine) and for operation above 500°C (for backup open flare). It will also be used along with pressure to determine the density of the gas combusted for use in determining $BG_{burnt,y}$.
QA/QC procedures to be applied:	Thermocouples will be calibrated or replaced each year.
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	$\mathbf{P_{flare}}$
Data unit:	Psi
Description:	Pressure in the exhaust gas of the flare.
Source of data to be used:	Measurements by farm owners.
Description of measurement methods and procedures to be	Measure the pressure of the exhaust gas stream in the flare when W_{CH4} is measured. Pressure will be used along with temperature to determine the density of the methane combusted.

applied:	
QA/QC procedures to be applied:	Instruments will be calibrated periodically.
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**Other flare operation parameters**
Data unit:	--
Description:	This will include all data and parameters (in addition to temperature-T_{flare} and flow-$BG_{burnt,y}$) that are required to monitor whether the gas combustion engine and backup open flare operates within the range of operating conditions according to the manufacturer's specifications
Source of data to be used:	Measurements by farm owners.
Description of measurement methods and procedures to be applied:	Measured continuously. Will be used to compare against manufacturers specifications.
QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**Ndy**
Data unit:	Days per year
Description:	The number of days that the animal manure management system capturing methane and flaring/combusting methane was operational.
Source of data to be used:	Recorded on farm based on actual operation.
Description of measurement methods and procedures to be applied:	Recorded data.
QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**$MS\%_{Bl,j}$**
Data unit:	Fraction
Description:	Fraction of manure handled in baseline animal manure management system "j"
Source of data to be used:	Recorded on farm based on actual operation.
Description of measurement methods and procedures to be applied:	Recorded data.

QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	$N_{LT,y}$
Data unit:	Number of heads
Description:	Annual average number of animals of type "LT" for the year "y"
Source of data to be used:	Farm recorded data keeping system.
Description of measurement methods and procedures to be applied:	The number of livestock in each farm is determined by the quantity of animals in the farm for a determined period taking into account the number of days the animals are alive on the farm in a specific year and is based on pig census and pig production reports provided by farmers. Archive electronically
QA/QC procedures to be applied:	Cross checked against indirect information (records of sales and food purchases for example).
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	$N_{da,y}$
Data unit:	Days
Description:	Number of days animal is alive in the farm in the year "y"
Source of data to be used:	Farm recorded data keeping system and transmitted to LBP-EPMD
Description of measurement methods and procedures to be applied:	As per farm records
QA/QC procedures to be applied:	Cross checked records for sale of animals
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	W_{site}
Data unit:	Kg
Description:	Average animal weight of the farm's livestock population.
Source of data to be used:	Farm recorded data keeping system and transmitted to LBP-EPMD
Description of measurement methods and procedures to be applied:	Weighed onsite for the entire population.
QA/QC procedures to be applied:	Cross checked against indirect information (records of sales and food purchases for example).
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**Genetic source of the production operations livestock originating from an**

	Annex I Party
Data unit:	--
Description:	Genetic source of the production operations livestock originating from an Annex I Party.
Source of data to be used:	Based on documentation of purchases of livestock.
Description of measurement methods and procedures to be applied:	--
QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**FFR**
Data unit:	--
Description:	Use of formulated feed rations.
Source of data to be used:	Based on on-farm record keeping, feed supplier and other documentation.
Description of measurement methods and procedures to be applied:	Information collected will validate that the farm is using formulated feed rations which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics.
QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**Qs**
Data unit:	m3
Description:	Quantity of sludge applied to land.
Source of data to be used:	Implemented as part of standard procedures which will be verified through periodic on-site inspection.
Description of measurement methods and procedures to be applied:	Procedures will be documented and periodically checked. Soil application procedures to ensure the final sludge is applied in a way that does not result in methane emissions. - Pumped from reactor and immediately spread for sun drying. - Drying done at 20 cm depth or less. - Fertilizer product never stored in piles greater than 30 cm. Applied to soil in well mixed layers less than 20 cm.
QA/QC procedures to be applied:	Periodic site inspection.
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**RVS**

Data unit:	%
Description:	Relative reduction of volatile solids from the previous stage (unitless).
Source of data to be used:	Farm recorded data keeping system and transmitted to LBP-EPMD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	--
Description of measurement methods and procedures to be applied:	Only applies to sequential manure management systems. This is estimated in a conservative manner based on monitored reductions in each stage for VS or using default values contained in AMSIII.D.
QA/QC procedures to be applied:	--
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**EGy**
Data unit:	MWh
Description:	Net quantity of electricity generated in the project plant during the year y
Source of data to be used:	Plant source. Electricity meter to be installed as part of the generation unit
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Actual measurement
Description of measurement methods and procedures to be applied:	To be measured from electrical meters installed at the plant. The proportion of data to be monitored is 100% and the data will be archived electronically.
QA/QC procedures to be applied:	internal audits, capacity assessments, equipment monitoring & performance standards, equipment calibration, process control
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**EC_{AE}**
Data unit:	kWh
Description:	Net quantity of electricity consumed by the auxiliary equipment within the project activity during the year y
Source of data to be used:	Electricity sub-meter
Value of data applied for the purpose of calculating expected	Actual measurement

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	To be measured from electrical sub-meters installed at the site. Data will be archived electronically.
QA/QC procedures to be applied:	internal audits, capacity assessments, equipment monitoring & performance standards, equipment calibration, process control
Any comment:	Data will be kept for two years after the end of the crediting period.

Data / Parameter:	$EC_{PJ,j,y}$
Data unit:	MWh
Description:	Quantity of electricity from the grid consumed by the project activity during the year MWh
Source of data to be used:	Project participants, electricity meter to be installed
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimated to be 0 for ex-ante calculations.
Description of measurement methods and procedures to be applied:	Electricity meter. Measured continuously, aggregated as required for the period used for the verification of the PoA
QA/QC procedures to be applied:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy
Any comment:	As per the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption";* scenario A Required to estimate the project emissions from electricity consumption per CPA Data will be kept for at least two years after the end of the crediting period.

Parameters to be monitored in CPAs where the grid is not considered reliable

Data / Parameter:	$FC_{i,,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton / yr or m3 / yr)
Description:	Quantity of fuel type combusted for energy generation during the year
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Specific for each CPA.

Description of measurement methods and procedures to be applied:	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
QA/QC procedures to be applied:	Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	Data will be kept for at least two years after the end of the crediting period.

Data / Parameter:	**NCVi,y**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type I in year y
Source of data used:	The following data sources may be used if the relevant conditions apply: Data source / Conditions for using the data source Values provided by the fuel supplier of the power plants in invoices / If data is collected from power plant operators (e.g, utilities). Regional or national average default values. / If values are reliable and documented in regional or national energy statistics /energy balances. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Specific for each CPA.
Description of measurement methods and procedures to be applied:	Calculated using government data from the most recent three historical years for which data is available at the time of submission of the CPA-DD to the DOE.
QA/QC procedures to	--

be applied:	
Any comment:	The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. In these cases a gross calorific value will also be used as a basis for the CO_2 emission factor.

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

☐ Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

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

>>
[insert environmental impacts]

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

>> No environmental compliance certificate (ECC), Initial Environmental Examination, or Environmental Impact Assessment (EIA) are necessary for the project activity (e.g., biodigester, methane capture facility) under Philippine law.
In the case of _____ Farms, the digester is covered by the ECC and discharge permit issued to the piggery farm. [modify as necessary]

SECTION D. Stakeholders' comments

>>

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

>> [insert description of stakeholders' consultation: venue, date, key participants, etc.]

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

>>
To set the stage for the consultation, the following were initially presented/discussed: [modify as necessary]

- Climate Change
- Clean Development Mechanism
- Process of CDM
- LBP Carbon Finance Support Facility
- _____ CDM Project

Comments/concerns of the stakeholders were subsequently solicited in an open manner and discussed. Minutes of the meeting are in Annex 4.

D.3. Summary of the comments received:

SUMMARY OF ISSUES AND CONCERNS AND RESPONSES/ RECOMMMENDED MEASURES TO ADDRESS THE ISSUE

Issues Raised	Responses/ Recommended Measures to Address Response

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

>> See above.

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	Land Bank of the Philippines
Street/P.O.Box:	1598 M.H. del Pilar cor. Dr. J. Quintos Sts
Building:	30th Floor, LANDBANK Plaza
City:	Malate, Manila
State/Region:	
Postfix/ZIP:	1004
Country:	Philippines
Telephone:	
FAX:	
E-Mail:	
URL:	www.landbank.com
Represented by:	
Title:	
Salutation:	Mr
Last Name:	Calado
Middle Name:	Estrada
First Name:	Prudencio III
Department:	Environmental Program and Management Department
Mobile:	+639189087705
Direct FAX:	+632-5288484
Direct tel:	+632-4057539
Personal E-Mail:	pcalado@mail.landbank.com / prudycalado@yahoo.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the project at _____ Farms.

Annex 3

BASELINE INFORMATION

[provide detailed description of system and costs of operation and maintenance and any necessary upgrading needed to continue to use the system]

II. Calculation of Emission Factor from the Grid

The Tool to Calculate the Emission Factor for an Electricity System (Version 02) is applied to calculate the combined margin emission factor. This section describes how the national emission factor has been determined as a combined margin (CM) based on the instructions for calculating the emission factors of the operating margin (OM) and build margin (BM).

According to the tool the grid emission factor is calculated as per the following seven 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: Identify the group of power units to be included in the build margin (BM).
STEP 6: Calculate the build margin emission factor.
STEP 7: Calculate the combined margin (CM) emissions factor.

STEP 1 - Identify the relevant electric power system

The relevant electric power system for the project is the XXX grid. The table below shows the net generation in MWh for the Luzon-Visayas grid.

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

The calculation of the operating margin and build margin emission factor will use the option I of the tool: *Only grid power plants are included in the calculation*.

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

According to the Tool, calculating the Operating Margin Emission Factor $EF_{grid,OM,,y}$ can be based on one of the four available methods:
(a) Simple OM,
(b) Simple adjusted OM,
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Any of the four methods above for calculating the operating margin emission factor can be used according to the tool. However, the Simple OM method (a) can only be used if low-cost/must-run resources constitute less than 50% of the total grid connection in: 1) average of the five most recent years, or 2) based on long-term average hydro-electric production.

The XXX grid in Philippines is predominantly fossil fuel-fired. Low-cost/must-run resources, consisting mostly of geothermal and hydro, have been responsible for less than 50% of generation during the past 5 years **(refer to the table above)**.

Based on the fact that the applicability condition of low cost/must run resources constituting less than 50% of the total grid connection in average of the five most recent years is satisfied, method (a) **Simple OM** has been selected as the method for calculating the operating margin.

According to the "*Tool to calculate the emission factor for an electricity system*", the Simple OM emission factor can be calculated using either of the two following data vintages:

- **Ex ante option:** A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- **Ex post option:** The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year *y* is usually only available later than six months after the end of year *y* then 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.

"**Ex ante option: A 3-year generation - weighted average**" has been selected for the purpose of emission reductions calculation for the proposed project.

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

The simple OM emission factor has been calculated based on a 3-year vintage (20XX-20XX). The OM is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system, excluding low-cost and must-run power plants.

The OM is calculated as follows (Option A1), using a 3-year average.
Under this option, the simple OM emission factor is calculated based on average efficiency and electricity generation of each plant, not including low-cost/must run resources and the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \bullet EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:
EFgrid,OMsimple,y Simple operating margin CO2 emission factor in year *y* (tCO2/MWh)
EGm,y Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
EFEL,m,y CO2 emission factor of power unit *m* in year *y* (tCO2/MWh)
m All power units serving the grid in year *y* except low-cost / must-run power units
y The relevant year of the chosen vintage data in Step 3 (i.e. 20XX,20XX,20XX)

To determine $EF_{EL,m,y}$, Option A2 is applied given that the data on fuel consumption is NOT available. The emission factor then is determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \bullet 3.6}{\eta_{m,y}}$$

Where:
EFEL,m,y CO2 emission factor of power unit *m* in year *y* (tCO2/MWh)
EFCO2,m,i,y Average CO2 emission factor of fuel type i used in power unit m in year *y* (tCO2/GJ)
ηm,y Average net energy conversion efficiency of power unit m in year y (ratio)
m All power units serving the grid in year *y* except low-cost/must-run power units
y The relevant year of the chosen vintage data in Step 3 (i.e. 2006,2007,2008)

The calculation of Operating Margin is illustrated in the following table.
Table

When calculating the Operation Margin, the Gross generation data for year 20XX, 20XX, 20XX have been employed to ensure the conservativeness of the results.

Therefore, the Simple operating margin emission factor for the Luzon-Visayas grid is 0.5889 tCO_2/MWh

« Operating Margin » (OM)	EF in tCO_2/MWh
20XX	
20XX	
20XX	
OM	

STEP 5 - Identify the group of power units to be included in the build margin (BM).

According to the tool, the sample group of power units m used to calculate the build margin consists of either:

(a) Calculate the build margin emission factor based the set of five power units that have been built most recently; or
(b) Consider the set of power capacity additions in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently.

From the above two options, the set of power units that comprises the larger annual generation is to be used. For the the XXX grid, the most recent capacity additions constituting 20 % of the system represent a larger annual generation than the 5 most recently added power units, and is therefore chosen as the sample group for the build margin. The most recently built plants have generated XXX MWh electricity representing XXX% of the overall electricity generated by all power plants in the XXX grid in year 20XX (Provided that 20% falls on part of the power generation of Ilijan power plant, Ilijan power plant is fully included in the calculation as per the Tool to Calculate the Emission Factor for an Electricity System - version 02).

For the XXX grid, the most recent capacity additions representing 20% of the system comprise larger annual generation than the 5 most recent plants, and are therefore the chosen as the build margin sample group:

Build Margin Plants[5] (to be updated by each CPA at inclusion)

Plant Name	Installed Cap (MW)	Plant Type
Sevilla Hydroelectric Plant	2.5	Hydro
PMDP II	15	Oil based
Northern Negro Geothermal Plant	49	Geothermal
5 MW Bunker (GBPC)	5	Oil based
12.5 MW Bunker (GBPC)	12.5	Oil based
20 MW Bunker (GBPC)	20	Oil based
Northwind Power**	33	Wind
Guimaras Power Project	3.4	Oil based
San Roque HE	345	Hydro
San Lorenzo Nat Gas	500	Nat Gas
Ilijan	1,200	Nat Gas

Note: **Northwind Power has been registered as a CDM project on September 10, 2006 and therefore excluded from the BM calculation.

The build margin emission factor is determined by applying *ex-ante* option based on the most recent information available.

STEP 6- Calculate the build margin emission factor

[5] Data are available via email by Philippines DOE

The Build Margin emissions factor (BM) is calculated as the generation-weighted average emission factor of the most recently built plants, using the following formula:

$$EF_{grid,BM,y} = \frac{\sum_{i,m} EG_{m,y} . EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

The calculation method for BM is as same as the one for OM (refer to the table below)

Plant Name	Power generation in 2008 (GWh)	Plant Type	Default CEF (tCO_2/GJ)	$\eta_{m,y}$	EF_{EL} (tCO_2/MWh)	tCO_2
Sevilla Hydroelectric Plant	1	Hydro	0		0	
PMDP II	18	Oil based	0.0726	0.395	0.66167	11,870.55
Northern Negro Geothermal Plant	0	Geothermal	0		0.00000	-
5 MW Bunker (GBPC)	6	Oil based	0.0726	0.395	0.66167	4,272.62
12.5 MW Bunker (GBPC)	0	Oil based	0.0726	0.395	0.66167	-
20 MW Bunker (GBPC)	22	Oil based	0.0726	0.395	0.66167	14,638.89
Guimaras Power Project	7	Oil based	0.0726	0.395	0.66167	4,336.27
San Roque HE	1080	Hydro	0			-
San Lorenzo Nat Gas	3825	Nat Gas	0.0543	0.395	0.49489	1,892,711.35
Ilijan	7833	Nat Gas	0.0543	0.395	0.49489	3,876,489.88
Total	12792					5,804,319.56
					BM	**0.4537**

The build margin emission factor is therefore 0.4537 tCO2/MWh.

STEP 7- Calculate the combined margin (CM) emissions factor

The final step in applying the tool is to calculate the combined margin emissions factor. This has been calculated as the weighted average of the emissions factor of the OM and the BM. The formula that has been used to calculate this weighted average emission factor is as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where

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

Therefore, $EF_{grid,CM,y}$ = 0.5*0.6296+0.5*0.4537 = **0.XXXX tCO_2/MWh**

As recommended by the tool for projects other than wind and solar projects, the default values of weighted factors w_{OM} = 0.5 & w_{BM} = 0.5 are used.

The latest default values recommended in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for the fuels emissions factors and Default efficiency factors for power plants in Annex 1 of the "Tool to calculate the emission factor for an electricity system-version 2" are used to derive the OM and the BM emission factors of the grid.

Grid emission factors computation

Designation	EF in tCO2/MWh
« Operating Margin » (OM)	
20XX	
20XX	
20XX	
Average OM	
« Build Margin » (BM)	
Combined Margin (weighted average OM and BM)	

Annex 4

MONITORING INFORMATION