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

CONTENTS

Annexes

NOTE:

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

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

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

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

Programmatic CDM Project for Energy Utilization of Broiler Chicken Manure in Ust-Kamenogorskaya Ptitse Fabrika (UK-PF), Kazakhstan

Version 1
2 March 2012

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

Ust-Kamenogorskaya Ptitse Fabrika (UK-PF) is one of the largest broiler chicken farms in Ust-Kamenogorsk, the Eastern Kazakhstan, annually raising approximately 1 million heads of chicken. The broiler farm currently utilizes coal boilers to produce heat and hot water for air-conditioning of broiler houses. The amount of coal consumption reaches around 40 thousand tons per year. On the other hand, it also generates about 30 thousand tons of chicken manure that are disposed at the open dumping area located within the boundary of UK-PF broiler chicken farm.

Photo 1: View of the UK-PF Broiler Farm

The central coal boiler is installed within the administration building and supplies hot water to each broiler houses shown as district A to F in the photo above. There is another small coal boiler within the district G to supply the hot water to the broiler houses in this district.

The basic concept of this programmatic CDM project is to convert the currently used coal boilers by installing the small-scale chicken manure boilers for each district in a phased manner under the scheme of programmatic CDM.

The chicken manure boilers will be installed for each district of broiler houses as shown in the figure below.

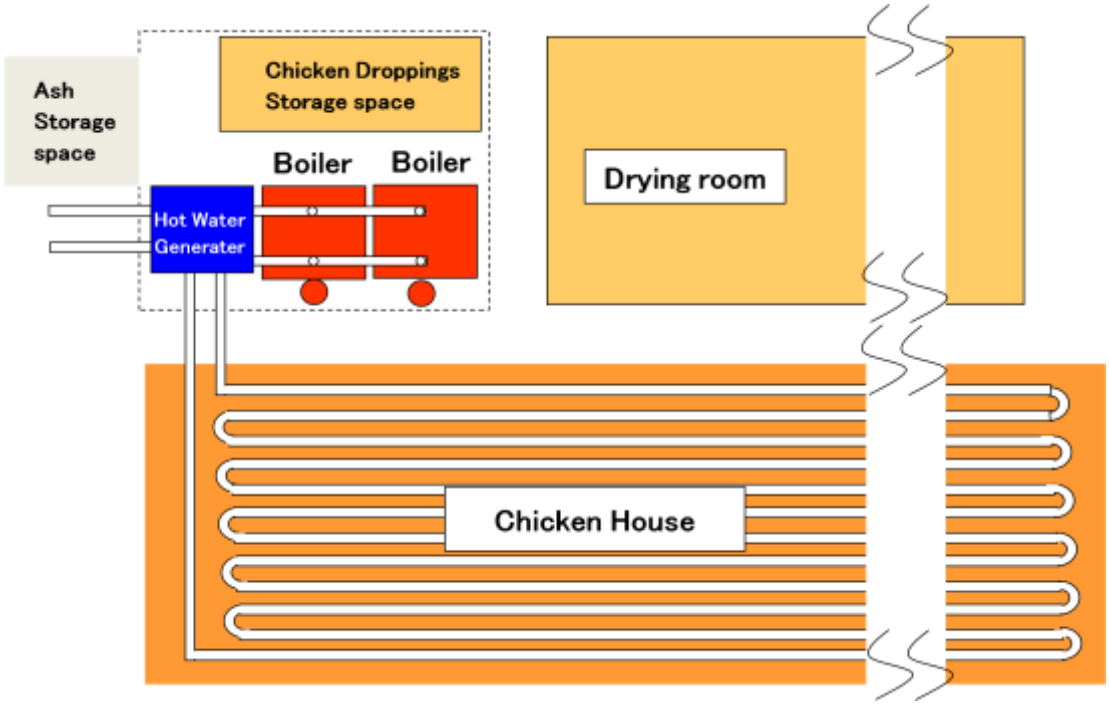


Figure 1: Facility Layout of Chicken Manure Boiler and Broiler Houses

The goal of this project is to completely convert the heat production and supply by coal boilers to chicken manure boilers in UK-PF.

Considering the potential environmental impacts by using the existing coal boilers such as air pollution (dust and SO_x emission) as well as the open dumping of chicken manure, UK-PF decided itself to install chicken manure boilers for the purpose of solving these two serious environmental impacts as the coordinating/management entity of this programmatic CDM project.

This programmatic CDM project contributes to sustainable development of the Kazakhstan in the following contexts:

Environmental Sustainability
The project utilizes renewable energy resources (poultry manure) to produce heat for supplying hot water to broiler houses. It reduces the emission of greenhouse gases and other air pollutants by reducing coal consumption in the currently used boilers. It also lowers the emission of methane from the open dumping site of poultry manure generated in the farm with minimization of poultry waste and offensive odour and potential pest generation. Thus, the project contributes to environmental well-being and sustainability.

Social and Economic Sustainability

The project contributes to increase economic sustainability of poultry farms through conversion from coal to poultry manure as the energy resource for heat production and supply to broiler houses. The fuel cost of poultry farm can be minimized in the mid and long term by increasing the use of poultry manure. It also reduces the cost of proper handling of manure. The potential environmental impacts arising from coal fuel use and poultry manure disposal are minimized to increase social and environmental acceptance of broiler farms. Thus, the project increases social and economic sustainability of broiler production, which is one of the policy priority areas of development in agriculture sector in Kazakhstan.

Technical Sustainability
The proposed project implements an innovative renewable energy technology that has never been applied in anywhere in Kazakhstan. However, the technology itself (poultry manure boiler) is a proven technology with enough operation records in Japan and the other countries. The successful introduction of this technology will increase the potential of poultry manure as an alternative renewable energy resources and mitigate the dependence upon coal in many poultry farms in Kazakhstan.

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

1. Coordinating or managing entity of the PoA as the entity which communicates with the Board

   Ust-Kamenogorskaya Ptitse Fabrika (UK-PF)

2. Project participants being registered in relation to the PoA.

Name of Party Involved	Private and/or public entity (ies) project participants (as applicable	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of the Republic of Kazakhstan	**Private Entity** Ust-Kamenogorskaya Ptitse Fabrika (UK-PF)	No
Government of Japan	**Private Entity** EX Research Institute Ltd.	No

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

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

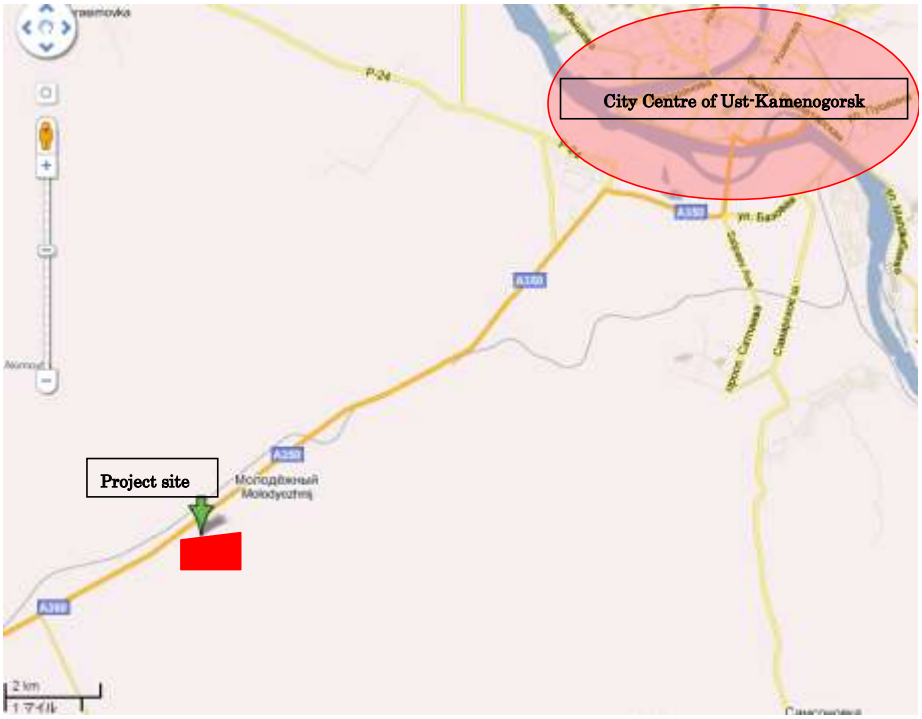
Republic of Kazakhstan

A.4.1.2. Physical/ Geographical boundary:

Physical and geographical boundary of the POA is the boundary of the poultry farm owned by UK-PF at Ust-Kamenogorsk, Kazakhstan. The following map shows the location and physical boundary of the POA. The latitude and longitude of the project site are 49º86’77.88” N and 82º46’71.55” E., which is about 20km away from the city centre area of Ust-Kamenogorsk. It is located along the national road of

A360, which connects the project site directly to the city centre.

Map 1: Location of Ust-Kamenogorsk in Kazakhstan



Map 2: Location of Project site in Ust-Kamenogorsk

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

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

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The technology to be employed by a typical small-scale CDM programme activity (SSC-CPA) is the heat production and hot water supply system with poultry manure boilers. The system comprises of 1 or 2 units of small scale poultry manure boilers with the maximum manure treatment (combustion) capacity not exceeding 400kg per hour that are to be introduced in a CPA of this PoA. It also consists of manure drying/storage facility, dust silo, and hot water heater as drawn in the figure below.

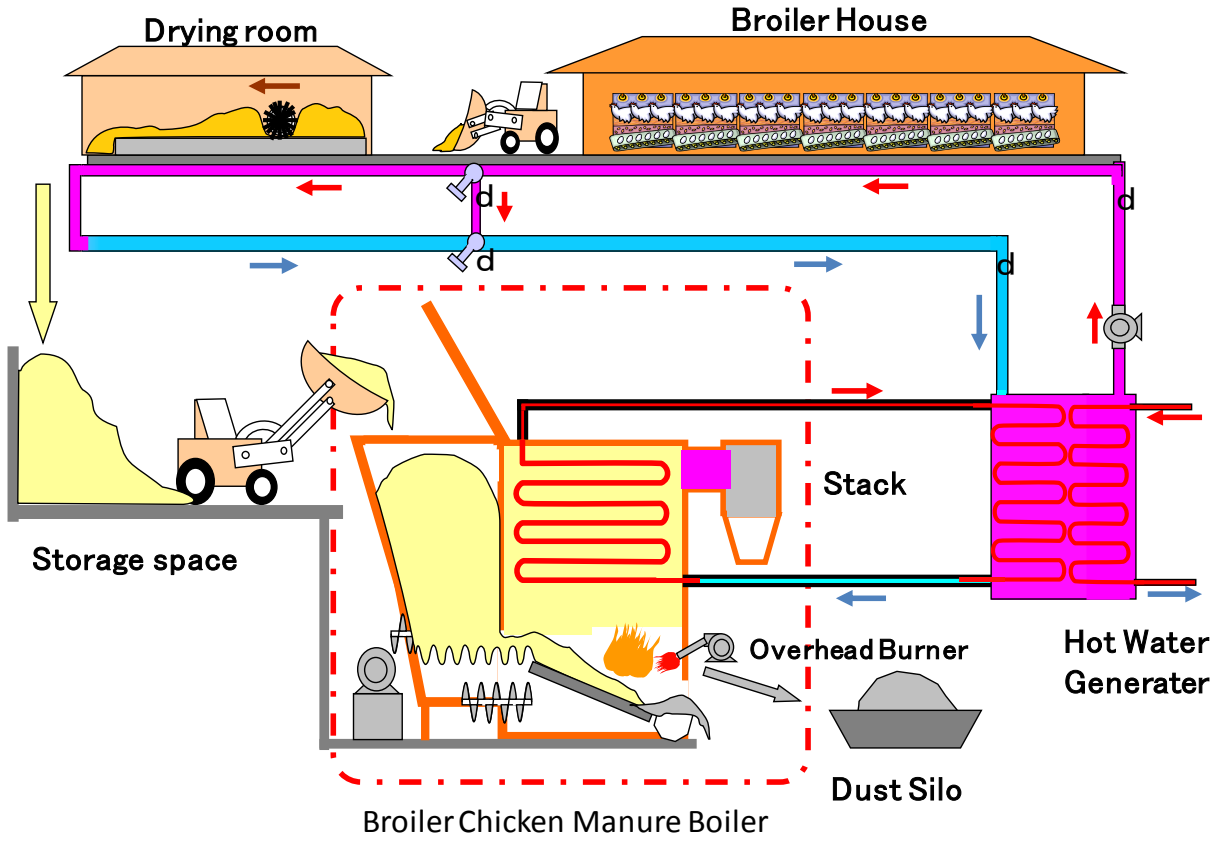

Figure 2: Typical Hot Water Supply System with Poultry Manure Boiler

The poultry manure boiler is a storker-type boiler, continuously incinerating poultry manure conveyed into the boiler while the heat produced from incineration is used for producing hot water with hot water generator. The amount of manure will be reduced by about 80% by weight with generation of non-hazardous ashes that can be utilized as soil conditioner or fertilizer.

This type of boilers are widely used in Japan as an environmentally-friendly poultry manure boilers with its complete compliance with the strict air emission standard.

The key specification of a typical poultry manure boiler are as follows:

- Poultry manure treatment (combustion capacity): 250kg/hour]
- Blower (capacity): 0.75kw ×3 sets

- Manure feed screw: 1.5kw (1unit)
- Dust discharging screw: 0.8kw (1unit)
- Line pump: 2.2kw (1set)
- Size: 4410mm×2516mm×2392mm (height)

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

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The eligibility criteria for inclusion of a SSC-CPA in the PoA are as follows:

(a) Located within the above-mentioned project boundary under the management of UK-PF,
(b) A project to apply AMS-I.C.: Thermal energy production with or without electricity (Version 18) and AMS-III.E.: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment (Version 16.0) as the baseline and monitoring methodology,
(c) A project to generate only thermal energy from poultry manure as the only energy sources (except for thre 1st ignition) which replaces the heat production from coal fuel boilers currently in operation within the project boundary.
(d) The technology to be employed is the incineration technology designed for poultry chicken manure.
(e) The maximum thermal energy generation volume is less than or equal to 45MWth.
(f) A project utilizes the poultry manure generated within the project boundary only and not procured from outside the project boundary.
(g) A project disposes the incineration residues (ashes) at the final disposal site designated by the CME of this PoA within the project boundary.

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

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This proposed PoA is a voluntary coordinated actions by UK-PF based on the project proposal by EX Research Institute Ltd. of Japan. The result of feasibility study on the proposed project (to be described in E5 of this PoA) clearly shows the economic non-viability with the internal rate of return lower than the economic benchmark of the Kazakhstan while it cannot return the initial investment within the durable years of the project facility, i.e. heat production and supply system from poultry manure boiler(s).

The current mandatory policies and regulations do not specify the use of fuels or technologies to be utilized in the broiler poultry farms for proper air conditioning of broiler house. The prevailing practice for air conditioning of broiler houses in Kazakhstan is the use of heat produced from coal boilers, as applied currently by UK-PF. Supply system of coal is stable with its lower price than other fossil fuels. The technology to manufacture and operate coal boilers are sufficiently accumulated in most of the broiler farms. Furthermore, the technology to be employed by the PoA has never been introduced to Kazakhstan so far in any form (not commercial and not operated in any fashion). In this respect, there is no possibility of the PoA to be implemented as a voluntary coordinated action without this PoA.

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

A.4.4.1. Operational and management plan:

As this proposed project is planned to be conducted within the geographical boundary of a broiler poultry farm owned and managed by UK-PF, it will work both as the CME of this PoA and a sole implementation entity of all CPAs. In this respect, all the operation, management and monitoring activities related to PoA are conducted by PoA. The UK-PF will arrange the following operation and management mechanism to implement the PoA.

Table 1: Operational and Management Items, Activities and Responsible Entities

No	Item	Activities	Responsible Entities
1	Facility operation	▪ Operation of poultry manure boilers in each CPA	UK-PF
2	Facility maintenance	▪ Maintenance and procurement of parts for CPA facilities and equipment	UK-PF
3	Monitoring	▪ Monitoring of parameters	UK-PF with technical support by EX Research Institute
4	Data record and archiving	▪ Recording the data of monitored parameters and its digital archiving	UK-PF with technical support by EX Research Institute
5	Identification of each CPA	▪ Unique identification number is issued for each CPA. ▪ To avoid double counting and manipulation, each CPA will be expressed with different information on: ➢ Issued number ➢ Unique CPA name/title ➢ Geograhical location with coordinates ➢ Unique photos of the CPA	UK-PF with technical support by EX Research Institute

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

Regular monitoring and recording of the monitoring parameters are conducted by a person in charge of these activities officially assigned by the technical director of UK-PF. The assigned person will be responsible for collecting, recording and archiving all the parameters for each CPA separately in a digital form. The record keeping system will separately keeps all the monitored data by each CPA by the assigned person of UK-PF.

(ii) A system/procedure to avoid double accounting

Each CPA is given unique identification and CPA name/titles with the exact geographical location with coordinates and unique photos with their monitored data. UK-PF will identify each CPA by these identifications to avoid double counting of CPA.

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

As all the SSC-CPAs in the PoA are conducted by a sole entity, any of the CPA developed during the Period of PoA can be the de-bundled component of another CPA or CDM project activity. To avoid this debundling, UK-PF will prepare the development plan of CPAs under the PoA with their geographical location within the project boundary and development time schedule. one CPA is also designed to be developed for each district of broiler houses (from Distrct A to District G, so 7 CPAs will be established in total during the POA period.).

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

As all the CPAs are conducted by a sole entity, UK-PF which is also CME, all the operating CPAs will be ensured to be subscribed to the PoA.

A.4.4.2. Monitoring plan:

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Monitoring will be conducted by a person in charge of the record keeping system assigned above by the technical director of UK-PF. Detailed responsibilities and authorities for project management, monitoring procedures and QA/QC procedures would be drawn up for the purpose and put in place. Duties thereof will be incorporated in the person's daily activity schedules to ensure data continuity and high-quality data collection. The monitoring will be conducted for verified for each CPA based on the monitored and recorded data for each CPA. Double counting of monitoring data is to be avoided by clearly defining each CPA with specifically identified each district of broiler houses in the project boundary.

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

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No public funding is involved in this PoA and related CPAs and it also never includes any diversion of ODA funds.

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

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

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1st of December 2012

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

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28 years

SECTION C. Environmental Analysis

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

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

According to the relevant laws and regulations in Kazakhstan,the environment analysis is required at both POA and SSC-CPA level.

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

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The potential environmental impacts of the CPAs under this POA is identified as follows:

(a) Risk of bio-safety due to installation of poultry manure boilers close to broiler houses

So far, the poultry manure generated from the broiler houses has been immediately transferred to the designated disposed area within the geographical boundary of the broiler farm, but enough far away from broiler houses.

However, installation of the poultry manure boilers close to broiler houses possible cause a threat of retaining the waste for a certain period of time before putting it into boilers. It may increase the risk of bio-safety of the products of the farm, broiler chicken.

To eliminate this threat, the poultry manure boiler system is designed in its scale and quality to immediately after its generation. The treatment capacity of boilers will be determined in accordance with the estimation of manure generation rate in the relevant broiler houses. It is also designed to accept manure with a comparatively high water content so that the generated manure can be immediately utillized as fuel for the boilers. The drying/storage house is constructed as a sealed facility to avoid transfer of any harmful substances to the products.

With these remedies, the potential bio-safety risk will be avoided by the Project.

(b) Residual incineration ashes generated from manure boilers

More or less of 20% by weight of the amount of manure incinerated by the boiler will be generated as residual ashes. However, the technology introduced to this project complies with the strict environmental standard and regulation in Japan. the potential environmental impact by generation of air emission and incineration ashes will be minimized while it will mitigate the impacts arising from air emission (dust and SOx from the existing coal boilers through reduction of coal consumption as well as the lowering the amount of manure disposed and stockpiled at the disposal site. The actual environmental condition will be improved through realizing these positive impacts.

(c) Handling of incineration residues generated from manure boilers

According to the actual operation of this manure boilers in Japan, the incineration residues (ashes) from the manure boilers can be utilized as the soil conditioner or fertilizers. Although the residues will be brought immediately to the designated disposal area within the project boundary in the early years of this PoA, the reuse and recycling of these residues will be considered to further minimize the waste generated from broiler houses.

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

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According to the current laws and regulations in Kazakhstan, every CPA is subject to environmental impact assessment regardless of its physical scale.

SECTION D. Stakeholders' comments

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

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

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

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Prior to the implementation of the Project, interviews were held for the purpose of explaining the objectives, processes, potential implications and benefits for the sustainable development of the PoA to the key relevant stakeholders, including national and local government agencies, financial institutes, multi-national donors, and so forth. Additional comments from the surrounding residents and other potential affected stakeholders will be further collected in the process of conducting the environmental impact assessment of this PoA through public hearing process or other methods. The stakeholders from which the public comments were collected are as follows:

National/local government agencies
- Climate Change Coordination Centre (Kazakhstan DNA under CDM)
- Government of the Eastern Kazakhstan

Private sector organizations
- UK-PF

International donors/institutes
- International Finance Corporation (IFC)
- European Bank for Reconstruction and Development (EBRD)

D.3. Summary of the comments received:

Interviewees are mostly supportive of the implantation of the PoA, viewing it as a win-win project that contributes to diversification of energy sources as well as improving the environment quality through reducing the generation of environmental pollutants generated from the current economic activities. Many interviewees also showed their expectation on the dissemination of the technology employed in the

PoA, as the "First of its kind" as the alternative win-win energy sources not only in Kazakhstan, but also in the neighbouring countries.

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

All clarifications about the proposed project activity were made during the interviews in response to the questions and requests by the interviewees.

SECTION E. Application of a baseline and monitoring methodology

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

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As to the estimation of GHGs emission reduction by the conversion of coal boilers with poultry manure boilers, the SSC methodology "AMS-IC: Thermal energy production with or without electricity (Version 19)" was applied with the following methodological tools:

- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion,
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption, and
- Tool to determine the baseline efficiency of thermal or electric energy generation systems.

On the other hand, the estimation of GHGs emission reduction through avoidance of methane emission from the disposal site is made by utilizing the SSC methodology "AMS-III.E.: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment (Version 16.0)" with some relevant methodological tools.

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

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Justification of the choice of the methodologies (AMS-I.C. and AMS-III.E.) and its applicability to a SSC-CPA under this PoA is explained in the following tables respectively.

(Application of AMS-I.C.)

AMS-I.C. comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. The poultry manure is categorized as the renewable biomass that converts the current use of coal for thermal energy supply by the CPAs under this PoA. Justification of the choice of AMS-I.C. and its applicability related to the CPA under this PoA is shown in the table below.

Table 2: Justification of the choice of AMS-I.C. and its Applicability

Applicability Criteria	Justification
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal	The total installed thermal energy generation capacity of the project equipment (poultry manure boiler) is equal to or less than 45 MW thermal.

Remark: Other Criteria in AMS-I.C. is not relevant to the CPA under this PoA

(Application of AMS-III.E.)

AMS-III.E. can be applied for the measures that avoid the methane production from decay of biomass through controlled combustion, gasification, or mechanical/thermal treatment. Justification of its choice and applicability related to the CPA under this PoA is shown in the table below.

Table 3: Justification of the choice of AMS-III.E. and its Applicability

Applicability Criteria	Justification
(1) This project category comprises measures that avoid the production of methane from biomass or other organic matter that: (a) Would have otherwise been left to decay under clearly anaerobic conditions throughout the crediting period in a solid waste disposal site without methane recovery, or (b) Is already deposited in a waste disposal site without methane recovery.	The proposed project complies with the condition (a) since the project will use poultry manure that would be disposed and left to decay under somehow anaerobic conditions to produce methane.
(2) Due to the project activity, decay of the wastes of type referred to in paragraph 1(a) and/or1(b) above is prevented through one of the following measures: (a) Controlled combustion; (b) Gasification to produce syngas/producer gas; (c) Mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB). An example of a mechanical/thermal treatment process is the pelletization of wood particles[2]	The proposed project avoids the methane emission through controlled combustion of manure with manure boilers, so complies with the condition (a).
(3) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.	The emission reduction achieved by the proposed project is less than 60kt CO_2.
(4) Where in the baseline usually there is a reduction in the amount of waste through regular open burning or removal for other applications, the use of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" shall be adjusted to take account of this burning or removal in order to estimate correctly the baseline emission.	In the proposed project, the amount of waste will not be reduced by open burning.
(5) The project activity does not recover or combust methane unlike AMS-III.G. Nevertheless, the location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.	The proposed project does not capture, collect and combust the methane from the waste disposal site.
(6) If the combustion facility, the produced syngas, producer gas or RDF/SB is used for heat and electricity generation within the project boundary, that component of the project activity shall use a corresponding methodology under Type I project activities.	Heat generation part of the proposed project used AMS-I.C.that corresponds to the methodology under Type I project activities.
(7) In case residual waste from controlled combustion, gasification or mechanical/thermal is stored under anaerobic conditions and/or delivered to a landfill	As the residue does not contain organic matters, it will generate no methane emission.

emissions from the residual waste shall to be taken into account using the first order decay model (FOD) described in AMS-III.G.	

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

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The boundary applied to each CPA under this POA includes:

(a) Physical and geographical location of the heat production and supply system with poultry manure boilers; and
(b) Broiler houses to which the heat produced in (a) is supplied in the form of hot water

The sources and gases included in the SSC-CPA boundary are as follows:

(Baseline Scenario)

Type of GHGs	Emission Source
CO_2	▪ Emission from consumption of coal in the baseline boilers that is converted by the proposed project with the heat supply from the poultry manure boilers
CH_4	▪ Emission from disposal of poultry manure that would have been disposed in the absence of the proposed project

(Project Scenario)

Type of GHGs	Emission Source
CO_2	▪ Emission from consumption of fossil fuels in the poultry manure boilers. (Not estimated in this proposed project since the use of fossil fuels in the boilers are minimal.)
	▪ Emission from consumption of electricity in the project.

(Leakage)

Type of GHGs	Emission Source
CO_2	▪ Leakage from the transfer of the currently used poultry manure boilers from outside project boundary. (Not estimated in this proposed project since the boilers are newly designed, manufactured and installed by the project.
	▪ Leakage from the transfer of the existing coal boilers are transferred outside the project boudndary. (Not estimated in this propose project since the existing coal boilers will be operated within the project boundary for the purpose of heat supply to the remaining broiler house after the implementation of the proposed project.

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

The baseline scenario was determined in accordance with the methodology applied for the proposed project; namely AMS-I.C. and AMS-III.E.

(Determination on the type of fuels used for heat production and supply to the broiler house in the baseline scenario)
The current practice of heat production and supply by the existing coal boilers is identified as the baseline scenario. This determination was made based on the identification of the most cost-effective heat supply for UK-PF at the present situation within the project boundary. There will be no additional investment required if the current heat supply from the existing boiler continues. Therefore, the type of fuel used is coal.

(Determination on the handling method of poultry manure in the baseline scenario)
In connection with the estimation of methane emission in accordance with AMS-III.E., the baseline scenario related to handling method of poultry manure is identified. At the present situation, the lowest cost option of manure handling is its disposal at the currently used disposal site within the project boundary. Therefore, the continuation of current practice of direct disposal of poultry manure at disposal site is identified as the baseline scenario related to AMS-III.E.

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

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

In accordance with the Annex 24 of EB63: Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities, the additionality of a small scale project can be demonstrated by objectively identifying one of the barriers mentioned below:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practices
- Other barriers

The proposed project identified the barriers of (a), (b), (c) to demonstrate its additionality below.

(a) Investment barrier
To demonstrate its investment barrier, the proposed project estimated its financial internal rate of return through discounted cashflow analysis. It also analyzed pay-back period of the project based on the estimation of project income and cost (initial investment and operation/maintenance). The details of the pre-conditions for this analysis, the estimations of income and cost, and analysis results are shown in the Annex 5 of this document. The result of this analysis is as shown in the table below.

Case 1	Financial Internal Rate of Return (IRR)	Payback Period
Case 1: The proposed project with income from selling the CERs	10.40%	7 years
Case 2: The proposed project without income from selling the CERs	-0.61%	11 years
Case 3: Case 1 with a decrease of the CER income by 10%	9.05%	7 years
Case 4: Case 1 with a decrease of the CER income by 20%	7.64%	7 years

In the case of the proposed project without the income from selling the CER, it is not feasible with a negative IRR (-0.61%) and payback period of 11years which is beyond the durable years of the project facility (poultry manure boilers). In the case of the proposed project wit the income from selling the CERs, the IRR shows higher value than the investment benchmark of Kaakhstan (7.5%) with the payback period of 7 years even though the CER income is discounted by 20% (US$8/ton$CO_2$). This result clearly shows the investment barrier of the proposed project without CER under CDM.

(b) Technological barrier

The fuel utilization technology of poultry manure in the boilers to be introduced in the proposed project is a technology of "First-of-its-kind" in Kazakhstan. Therefore, there is a definitive technological barrier against application of this technology in this country.

The Annex 11 of EB63: Guidelines on Additonality of First-of-its-kind Project Activities identify its definition and eligibility conditions as shown in the table below:

Definition	Eligible physical/geographical extent	▪ Default physical/geographical extent of "First-of-its-kind" is the whole area of the host country. ▪ If the project extends beyond a country, it can also extend beyond the country. ▪ If the geographical extent is less than the boundary of host country, justification is required to prove that the technology is the "First-of-its-kind" within the project boundary.
	Measures	▪ The measures in relation to the following areas are currently included as the technology of the "First-of-its-kind. ➢ Switch of fuel or feedstock ➢ Change of technology including fuel switch or not (Energy efficiency improvement technologies and measures are also included.) ➢ Destruction of methane ➢ Avoidance of methane generation
	Technology	▪ The technologies which provide same output (products or services) with one of the differences in the following terms: ➢ Energy sources/fuels ➢ Feedstock ➢ Scale of facility/equipment (micro, small or large)
Eligibility Conditions		▪ The measures/technologies adopted by the project are different from the currently applied ones (conventional measures/technologies) within the geographical extent of the proposed project at the beginning of the project. ▪ The project participants set the credit period of 10 years or less at its maximum.

The poultry manure boiler belongs to the measures of fuel switch and avoidance of methane emissions while it deals with energy sources/fuels. The technology has never been utilized in any areas or sectors of Kazakhstan. The project participants set the credit period of each CPA under this POA at 10 years. Thus the proposed project complies with the definitions and eligibility conditions of "First-of-its-kind" and demonstrates its technological barrier.

(c) Barrier due to prevailing practices

Currently, almost all broiler farms in Kazakhstan utilizes coal boilers for air conditioning of broiler houses. Coal supply market and system is stable while all the broiler farms have sufficient experience

and know-how of coal boiler maintenance and operation. On the other hand, there is completely no experience of manufacturing as well as operating poultry manure boilers in Kazakhstan. Supply of poultry manure as the alternative fuel is entirely unprepared.

In this respect, there is a clear barrier against introduction of the project technology due to prevailing practices.

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

Assessment of the additionality of a SSC-CPA is carried out in accordance with the identification of the barriers mentioned in E.5.1 above. Therefore, the investment and technological barriers and the barrier due to prevailing practices are tested and demonstrated at the time adopting a SSC-CPA.

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

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

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As to the estimation of GHGs emission reduction by the conversion of coal boilers with poultry manure boilers by a typical SSC-CPA, the SSC methodology "AMS-IC: Thermal energy production with or without electricity (Version 19)" is applied with the following methodological tools:

- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion,
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption, and
- Tool to determine the baseline efficiency of thermal or electric energy generation systems.

On the other hand, the estimation of GHGs emission reduction through avoidance of methane emission from the disposal site is made by utilizing the SSC methodology "AMS-III.E.: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment (Version 16.0)" with some relevant methodological tools.

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

(a) Estimation based on AMS-I.C.

(Baseline Emission)
In accordance with the simplified baseline methodology for the small scale CDM projects under AMS-I.C., the baseline emission is estimated by the following equation:

$$BE_{thermal,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) \cdot EF_{FF,CO2}$$

Where:

$BE_{thermal,CO2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year *y* (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)

$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2/TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

The fixed parameters to be utilized in the above baseline emission estimation are as follows:

$\eta_{BL,thermal}$	0.6

(Project Emission)
Project emission in accordance with AMS-I.C., shall include the following sources:

- CO_2 emissions from on-site consumption of fossil fuels due to the project activity
- CO_2 emissions from electricity consumption by the project activity
- Any other significant emissions associated with project activity within the project boundary

In the case of the proposed project, on-site consumption of fossil fuels by the poultry manure boilers in the project activity is minimal and ignorable since they are only utilized at the time of its ignition. It also has no other significant emission emissions associated with project activity than the emission from electricity consumption by the project activity. Therefore, the project emission in the proposed project is estimated by the equation below.

$$PE_y = PE_{CO2,EC,y}$$

Where:

PE_y	=	Project emissions in year y (tCO_2/y)
$PE_{CO2,EC,y}$	=	CO_2 emissions from electricity consumption by the project activity (tCO_2/yr)

In the equation above, CO_2 emission from electricity consumption by the project activity ($PE_{CO2,EC,y}$) is estimated by the formula below.

$$PE_{CO2,EC,y} = EC_{PJ,y} \cdot EF_{grid,y}$$

Where:

$PE_{CO2,EC,y}$	=	CO_2 emissions from electricity consumption by the project activity (tCO_2/yr)
$EC_{PJ,y}$	=	Electricity consumption by the project activity (MWh)
$EF_{grid,y}$	=	CO_2 emission factor of the grid electricity (tCO_2/MWh)

(Leakage)
AMS-I.C. requires the following leakage estimation:

- If the energy generating equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered.
- In case collection/processing/transportation of biomass residues is outside the project boundary CO_2

emissions from collection/processing/transportation[13] of biomass residues to the project site.

In the case of the proposed project, the poultry manure boilers are newly manufactured for the project: therefore no leakage will occur due to transfer of equipment from outside the project boundary. On the other hand, poultry manure to be utilized as the fuel is also procured within the project boundary and no leakage will arise from collection/processing/transport of biomass residues to the project site.

Thus, the leakage emission from the proposed project in accordance with AMS-I.C. can be regarded as none.

(Emission reduction)
The emission reduction from the proposed project is estimated by the equation below:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e)

BE_y = Baseline emissions in year *y* (tCO_2e)

PE_y = Project emissions in year *y* (tCO_2)

LE_y = Leakage emissions in year *y* (tCO_2)

(b) <u>Estimation based on AMS-III.E.</u>

(Baseline emission)
The baseline emission in the proposed project is estimated as the amount of methane emission from decay of the poultry manure to be disposed at the disposal site in the absence of the project activity. According to AMS-III.E., the amount of methane emission is estimated by the use of the "Tool to determine methane emissions avoided from disposal of waste at a solid disposal site", as shown in the equation below.

$$BE_{y,CH4} = \varphi \cdot (1 - f) \cdot GWP_{CH4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

Where:

$BE_{y,CH4}$	Methane emissions during the year y from waste disposal at the solid waste disposal site (SWDS) during the period from the start of waste disposal activity to the end of the year y (tCO_2e)
Φ	Model correction factor to account for model uncertainties (fixed parameter: 0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner (fixed parameter: 0)
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for commitment(fixed parameter: 12)
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste (default value: 0.1)

F	Fraction of methane in the SWDS gas (volume fraction) (default value:0.5)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose (default value:0.5)
MCF	Methane correction factor (determined by types of SWDS)
$W_{j,x}$	Amount of organic waste type j disposed at the SWDS in the year x (tons)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type j
k_j	Decay rate for the waste type j
j	Waste type category
x	Year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated (x=y)
y	Year for which methane emissions are calculated.

The fixed parameters to be utilized for estimating the baseline emission in the proposed project is as follows:

MCF	0.28: recommended conservative value in the case of stockpiling the waste
k_j	0.05: recommended conservative value in the case of stockpiling the waste

(Project Emission)
AMS-III.E. requires the estimation of the project emissions from the following sources:

- CO2 emissions related to the gasification and combustion of the non-biomass carbon content of the waste (plastics, rubber and fossil derived carbon) or RDF/SB and auxiliary fossil fuels used in the combustion, gasification or mechanical/thermal treatment facility;
- Incremental CO2 emissions due to:
  - Incremental distances between the collection points to the project site as compared to the baseline disposal site;
  - Transportation of combustion residues and final waste from controlled burning to disposal site;
- CO2 emissions related to the fossil fuel and/or electricity consumed by the project activity facilities, including the equipment for air pollution control required by regulations. In case the project activity consumes grid-based electricity, the grid emission factor (tCO2e/MWh) should be used, or it should be assumed that diesel generators would have provided a similar amount of electricity, calculated as described in category I.D.

In the case of the proposed project, consumption of fossil fuels by the project activity is minimal and igonorable as mentioned above.

Further, there is no incremental CO_2 emission due to incremental distance between the collection points to the project site as compared to the baseline project site since the project collects the poultry manure generated within the project site. The transportation of combustion residues from poultry manure boilers to disposal site does not increase the transport distance compared with baseline case.

The CO_2 emission from electricity consumption by the project activity is estimated in the equation above in accordance with AMS-I.C.
Thus, the project emission in relation to AMS-III.E. can be regarded as none in the proposed project.

(Leakage)
AMS-III.E. requires that leakage effects at the site of the other activity are to be considered if the controlled combustion, gasification or mechanical/thermal treatment technology is equipment transferred from another activity or if the existing equipment is transferred to another activity.

However, in the case of the proposed project, none of the above leakage effects occur as there is no transfer of project facilities and equipment from outside the project boundary while the existing equipment is not transferred to another activity.

Thus, the leakage emission can be regarded as none in the case of the proposed project.

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

Detailed information on the data and parameters that do not require monitoring are described below. Data and parameters used for ex-ante calculation that need to be monitored after project implementation are shown in E.7.1.

Data / Parameter:	ϕ
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied:	Conservative value is applied
Any comment:	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results

Data / Parameter:	OX
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	Conduct a site visit at the solid waste disposal site in order to assess the type of cover of the solid waste disposal site. Use the IPCC 2006 Guidelines for National Greenhouse Gas Inventories for the choice of the value to be applied
Value applied:	Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites
Justification of the choice of data or description of measurement methods and procedures actually applied:	On-site inspection of the conditions of the existing solid waste disposal site.
Any comment:	-

Data / Parameter:	F
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default value is applied.
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0 is recommended by IPCC

Data / Parameter:	DOC_f
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default value is applied.
Any comment:	-

Data / Parameter:	MCF
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	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 the 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 and/or with high water table**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste; ▪ 0.4 for **unmanaged-shallow solid waste disposal sites.** This comprises all

	SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres ▪ Due to the high uncertainty in the estimation of **methane emissions from stockpiles**, conservative assumptions shall be made for the MCF. As piles have a large surface area to volume ratio anaerobic conditions are not ensured like in the case of SWDS. For the purpose of this methodology, project participants shall use an MCF value of **0.28**. This is the MCF value for an unmanaged shallow SWDS (0.4) minus the 30% uncertainty range as specified in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Justification of the choice of data or description of measurement methods and procedures actually applied:	On-site inspection of the solid waste disposal site in terms of its physical and operational conditions.
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS

Data / Parameter:	DOC_j
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	Apply the following values for the different waste types *j*:

Waste type *j*	**DOC_j (% wet waste)**	**DOC_j (% dry waste)**
Wood and wood products	43	50
Pulp, paper and cardboard (other than sludge)	40	44
Food, food waste, beverages and tobacco (other than sludge)	15	38
Textiles	24	30
Garden, yard and park waste	20	49
Glass, plastic, metal, other inert waste	0	0

If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose, among the waste types that have similar characteristics, the waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of/deviation from this methodology.

Justification of the choice of data or description of measurement methods and procedures actually applied:	Analysis and characterization/categorization of the poultry manure on-site.
Any comment:	-

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	Apply the following default values for the different waste types *j*

Waste type *j*		**Boreal and Temperate (MAT≤20°C)**		**Tropical (MAT>20°C)**	
		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)
Slowly Degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately Degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17
Rapidly Degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40

NB: MAT - mean annual temperature, MAP - Mean annual precipitation, PET - potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration.

If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose, among the waste types that have similar characteristics, the waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of/deviation from this methodology. In the case of empty fruit bunches (EFB), as their characteristics are similar to gardenwaste, the parameter values correspondent of garden waste shall be used. In case of sludge from pulp and paper industry, a conservative value of 0.03 shall be used for all precipitation and temperature combinations.

Due to the high uncertainty in the estimation of methane emissions from stockpiles, conservative assumptions shall be made for k values given in the Tool. As the homogenous nature of the waste in stockpiles result in a different decay rate compared to normal SWDS that contain mixed wastes. For the purpose of this methodology, project participants shall use the k value for the relevant waste type

	must be the lower value from the range provided for the Boreal and Temperate Climate Zone as listed in Table 3.3 in Chapter 3, volume 5 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories..
Justification of the choice of data or description of measurement methods and procedures actually applied:	On-site inspection and characterization of the existing solid waste disposal site.
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references

Data / Parameter:	$\eta_{BL,thermal}$
Data unit:	-
Description:	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
Source of data used:	Data reported by UK-PF
Value applied:	0.6
Justification of the choice of data or description of measurement methods and procedures actually applied:	On site specific data or default value to be applied
Any comment:	According to SSC AMS I.C.(ver.18) determined by adopting one of the following criteria: a) Highest measured operational efficiency over the full range of operating conditions of a unit with similar specifications, using baseline fuel. The efficiency tests shall be conducted following the guidance provided in relevant national/international standards; b) Highest of the efficiency values provided by two or more manufacturers for units with similar specifications, using the baseline fuel; c) Default efficiency 100%

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

The monitoring methodologies to be applied to the proposed project are based on AMS-I.C. and AMS-III.E. respectively for each CPA. Data and parameters to be monitored by each SSC-CPA during the credit period are given below.

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

(a) Data and parameters to be monitored by each SSC-CPA in relation to AMS-I.C.

Data / Parameter:	
Description:	Continuous operation of the equipment/system
Unit:	-
Monitoring/recording frequency:	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance.
Measurement methods and procedures:	Recording of thermal energy output based on metering of calibrated thermometer for each CPA.

Data / Parameter:	EF_{CO2}
Description:	CO_2 emission factor for the grid electricity in year y
Unit:	tCO_2e/kWh
Monitoring/recording frequency:	
Measurement methods and procedures:	As described in AMS-I.D

Data / Parameter:	$EF_{CO2,i}$
Description:	CO_2 emission factor of fossil fuel type i
Unit:	tCO_2e/GJ
Monitoring/recording frequency:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".
Measurement methods and procedures:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Data / Parameter:	
Description:	Quantity of electricity generated/supplied
Unit:	MWh
Monitoring/recording frequency:	Continuous monitoring, integrated hourly and at least monthly recording.
Measurement methods and procedures:	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of .General guidelines to SSC CDM methodologies. In case the project activity is exporting electricity to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient.

Data / Parameter:	
Description:	Quantity of hot air
Unit:	Nm^3/hr
Monitoring/recording	Continuous monitoring, integrated hourly and at least monthly recordings

frequency:	
Measurement methods and procedures:	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of .General guidelines to SSC CDM methodologies.. If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Where it is not feasible (e.g. because of too high temperature), spot measurements can be used through sampling with a 90% confidence level and a 10% precision.

Data / Parameter:	
Description:	Quantity of steam
Unit:	Nm^3/hr
Monitoring/recording frequency:	Continuous monitoring, integrated hourly and at least monthly recordings
Measurement methods and procedures:	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of .General guidelines to SSC CDM methodologies.. If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts).

Data / Parameter:	
Description:	Net quantity of thermal energy supplied by the project activity during the year y
Unit:	TJ
Monitoring/recording frequency:	Continuous monitoring, aggregated annually.
Measurement methods and procedures:	Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. In case of equipment that produces hot water/oil this is expressed as the difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as the difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient.s end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts).

	Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient.
Data / Parameter:	
Description:	Quantity of fossil fuel type j combusted in year y
Unit:	Mass or volume unit
Monitoring/recording frequency:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".
Measurement methods and procedures:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Data / Parameter:	$B_{Biomass,y}$
Description:	Net quantity of biomass consumed in year y
Unit:	Mass or volume
Monitoring/recording frequency:	Continuously and estimate using annual mass/energy balance
Measurement methods and procedures:	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass shall be measured continuously or in batches. If more than one type of biomass fuel is consumed, each shall be monitored separately. For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, NCV of the processed biomass that is supplied to users with an appropriate sampling frequency. Cross-check: Cross-check the measurements with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. In cases where emission reductions are calculated based on energy output, check the consistency of measurements ex post with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined ex ante.

Data / Parameter:	
Description:	Moisture content of the biomass (wet basis)
Unit:	%
Monitoring/recording frequency:	The moisture content of biomass of homogeneous quality shall be monitored for each batch of biomass. The weighted average should be calculated for each monitoring period and used in the calculations.
Measurement methods and procedures:	On-site measurements. This applies in the case where emission reductions are calculated based on biomass energy input. For all cases, ex ante estimates should be provided in the PDD and used during the crediting period.

	In case of dry biomass, monitoring of this parameter is not necessary.

Data / Parameter:	T
Description:	Temperature
Unit:	°C
Monitoring/recording frequency:	Continuous monitoring, integrated hourly and at least monthly recording.
Measurement methods and procedures:	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies".

Data / Parameter:	P
Description:	Pressure
Unit:	kg/cm^2
Monitoring/recording frequency:	Continuous monitoring, integrated hourly and at least monthly recording.
Measurement methods and procedures:	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies".

Data / Parameter:	$NCV_{i,y}$
Description:	Net calorific value of fossil fuel type i
Unit:	GJ/mass or volume unit
Monitoring/recording frequency:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel Combustion".
Measurement methods and procedures:	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel Combustion".

Data / Parameter:	NCV_k
Description:	Net calorific value of biomass type k
Unit:	GJ/mass or volume unit
Monitoring/recording frequency:	Determine once in the first year of the crediting period.
Measurement methods and procedures:	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements)

(b) Data and parameters to be monitored by each SSC-CPA in relation to AMS-III.E.

Data / Parameter:	f
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data	Written information from the operator of the solid waste disposal site and/or site visits at the solid waste disposal site
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e / tCH_4
Description:	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data	Decisions under UNFCCC and the Kyoto Protocol (a value of 21 is to be applied for the first commitment period of the Kyoto Protocol)
Monitoring frequency:	Annually
Any comment:	-

Data / Parameter:	W_x
Data unit:	Tons
Description:	Total amount of organic waste prevented from disposal in year *x* (tons)
Source of data	Measurements by project participants
Measurement procedures (if any):	-
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$p_{n,j,x}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
Source of data	Sample measurements by project participants
Measurement procedures (if any):	Sample the waste prevented from disposal, using the waste categories *j*, as provided in the table for DOC_j and k_j, and weigh each waste fraction
Monitoring frequency:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year
QA/QC procedures:	-
Any comment:	This parameter only needs to be monitored if the waste prevented from disposal includes several waste categories *j*, as categorized in the tables for DOC_j and k_j

Data / Parameter:	Z
Data unit:	-

Description:	Number of samples collected during the year *x*
Source of data	Project participants
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures:	-
Any comment:	This parameter only needs to be monitored if the waste prevented from disposal includes several waste categories *j*, as categorized in the tables for DOC_j and k_j

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

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Monitoring will be conducted by a person in charge of the record keeping system assigned above by the technical director of UK-PF. Detailed responsibilities and authorities for project management, monitoring procedures and QA/QC procedures would be drawn up for the purpose and put in place. Duties thereof will be incorporated in the person's daily activity schedules to ensure data continuity and high-quality data collection. The monitoring will be conducted for each CPA based on the monitored and recorded data for each CPA. Double counting of monitoring data is to be avoided by clearly defining each CPA with specifically identified each district of broiler houses in the project boundary.

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

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Date: to be filled.

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Annex 1

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Represented by:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity.

Annex 3

BASELINE INFORMATION

All baseline information is provided in Section E.

Annex 4

MONITORING INFORMATION

All monitoring information is provided in Section E.7.1 and E.7.2.

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