Monitoring report form for CDM project activity
(Version 07.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	IOT Mabagas Limited power plant, Pudhuchatram	
UNFCCC reference number of the project activity	8288	
Version number of the PDD applicable to this monitoring report	5.5	
Version number of this monitoring report	6	
Completion date of this monitoring report	13/03/2020	
Monitoring period number	2nd	
Duration of this monitoring period	01/08/2015 to 31/08/2017	
Monitoring report number for this monitoring period	NA	
Project participants	IOT Mabagas Limited (IML), Carbonbay GmbH & Co. KG	
Host Party	India	
Applied methodologies and standardized baselines	AMS-III.AO. Version 1.0 - Methane recovery through controlled anaerobic digestion AMS-I.D. Version 17 - Grid connected renewable electricity generation	
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources) 13 : Waste handling and disposal	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	19,193 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	46,608 tCO2e	

SECTION A. Description of project activity

A.1. General description of project activity

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Project Participants

IOT Mabagas Limited (IML) is a 50: 50 joint venture (JV) company between M/s IOT Infrastructure & Energy Services Limited and Mabagas International, Germany. IOT is group company of M/s Indian Oil Corporation (State Owned Navarathna Oil Company in India) and Mabagas International is 100% subsidiary of Marquard & Bahls, Germany. IML is formed to invest, build, own and operate renewable energy projects in India with specific focus on waste to energy plants. IML believes that waste management and converting the waste into useful energy is on one hand a great challenge to society and on the other hand a great opportunity for a more sustainable future.

Project activity

In the village of Thattayangarpatti, in the Puduchatram block of Namakkal district, the project participant, IML, intends to build and operate an anaerobic digestion plant. The plant will produce biogas with which 2.4 MW of renewable electricity will be generated as part of the greenfield project activity. Through this project activity the amount of greenhouse gases (methane and carbon dioxide) emitted into the atmosphere will be reduced.

Pre-Project Scenario

In the pre-project scenario, poultry litter is generated at poultry farms in Namakkal district. The bottom of the cages is open, hence litter is allowed to drop down and pile up continuously. After a period of up to six months the litter will be collected and transported to a nearby drying yard or dumping area where it is allowed to further degrade. Such storage conditions and piling up results in anaerobic conditions, leading to methane emissions into the atmosphere due to anaerobic decomposition of the poultry litter. Further feedstock for the project activity are cow dung, and waste streams from the sugar and tapioca processing industries. These wastes are left to decay or not handled properly (stockpiled or treated in uncovered lagoons without proper aeration as further elaborated in table 4.1.c below) and therefore release methane into the atmosphere. This methane release is avoided by treating it in waste-to-energy plants such as the project activity. However, since the Project Participant cannot properly determine the exact baseline for these additional waste streams, their baseline emissions are not included in the emission reduction calculations as stipulated by the used small-scale methodology.

Post - Project Scenario

In the post-project scenario, the project participant procures the poultry litter from the nearby poultry farms in the district. The other wastes (cow dung and agricultural wastes.) are also procured from nearby sites. The litter will be collected each 10 to 15 days and will be delivered to a substrate storage area at site and is off-loaded onto a scraper floor (bunker type feeding system) together with the other wastes. All wastes are fed into 4 continuously stirred digesters with a total working volume of 16,000 m3. Under controlled conditions biogas is produced through a bio-methanation process, which recovers the methane (biogas) from the litter. The biogas that is generated in the digesters is taken out through a common pipe and is then cooled down to remove moisture before it is fed via blowers into 2 x 1.2 MW biogas engines (2.4 MW total capacity) for the generation of power. The generated electricity (after consuming for internal operation of the plant) is supplied to the state electricity board via a dedicated 22 kV transmission line feeder to the nearby substation. The supplied electricity is sold by the project participant to the distribution licensee as per the modalities of the Energy Biomass Purchase Agreement.

The basic technology concept for the project activity is reaching maturity in western countries especially in Germany (where Mabagas has prior experience with a biogas plant in Lünen) and the Netherlands. IML is aiming to adapt the technology know-how existing in Europe to domestic circumstances and environments. However, the amount of poultry litter to be digested in the planned project activity is unusually high and poses technological challenges since no similar plant exists to serve as a role model. PP have a research lab in Mumbai conducting experiments on Continuous Stirred Tank Reactor (CSTR) models of digesters to simulate operating conditions of a

prototype of biogas plant, which is envisaged in the project activity. So far around 10 batch tests are successfully conducted. Also the PP has been sending samples of solid and liquid fertilizers to other reputed labs for substantiations of results.

The plant is designed to operate on a mix of approximately 37,000 metric tonnes per annum of poultry litter, 58,000 metric tonnes per annum of agricultural waste streams from the sugar and tapioca processing industries and 1,825 metric tonnes per annum of cow dung. This should result in generation of around 7.9 million cubic meters per annum of biogas, which is expected to generate around 15.4 GWh of gross electricity. Thus, the project activity contributes to the reduction in GHG emissions on account of:

- Methane Avoidance: The project activity avoids methane release in the atmosphere that would have occurred due to uncontrolled poultry litter disposal / storage practices in the district.
- Power generation: The project activity generates electricity from the biogas generated from the poultry litter and organic wastes thereby replacing equivalent grid mix in the Southern grid.

It is estimated that the project activity will abate approximately 22,355 tCO_2e per annum

A.2. Location of project activity

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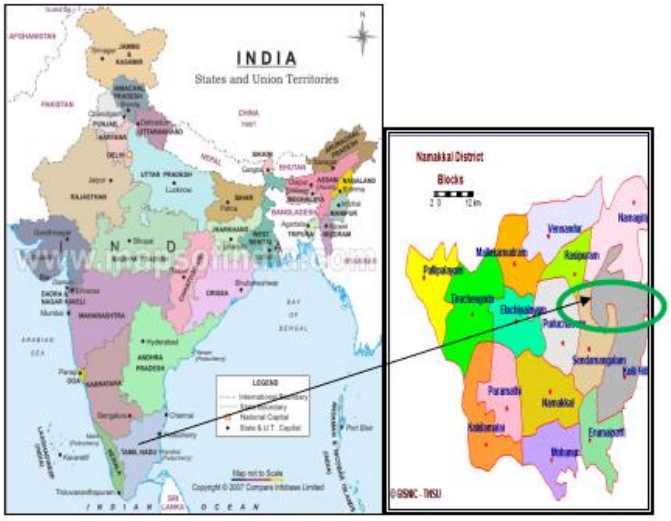
Village - SF. Nos.52/1, 52/2, 53/1A and 53/2A Thattayangarpatti, Block - Pudhuchatram, District - Namakkal State - Tamil Nadu Host Country - India

The unique coordinates (latitude and longitude) are 11°23'29.64"N by 78°10'41.44"E.



A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	IOT Mabagas Limited	No
Germany	Carbonbay GmbH & Co. KG	No

A.4. References to applied methodologies and standardized baselines

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AMS-III.AO. ver. 01 Methane recovery through controlled anaerobic digestion.
AMS-I.D. ver. 17 - Grid connected renewable electricity generation
The tools used in calculating the emission reductions of the project activity are:

- Tool to calculate the emission factor for an electricity system. Ver 02.2.1

- Tool to determine project emissions from flaring gases containing methane. Ver 01
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion. Ver 02
- Tool to calculate baseline, project and /or leakage emissions from electricity consumption Ver 01

A.5. Crediting period type and duration

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Type of crediting period: 10 years fixed crediting period Starting date of the crediting period: 01/01/2013
Length of the crediting period corresponding to this monitoring period: 10 years and 00 month from 01/01/2013 to 31/12/2022

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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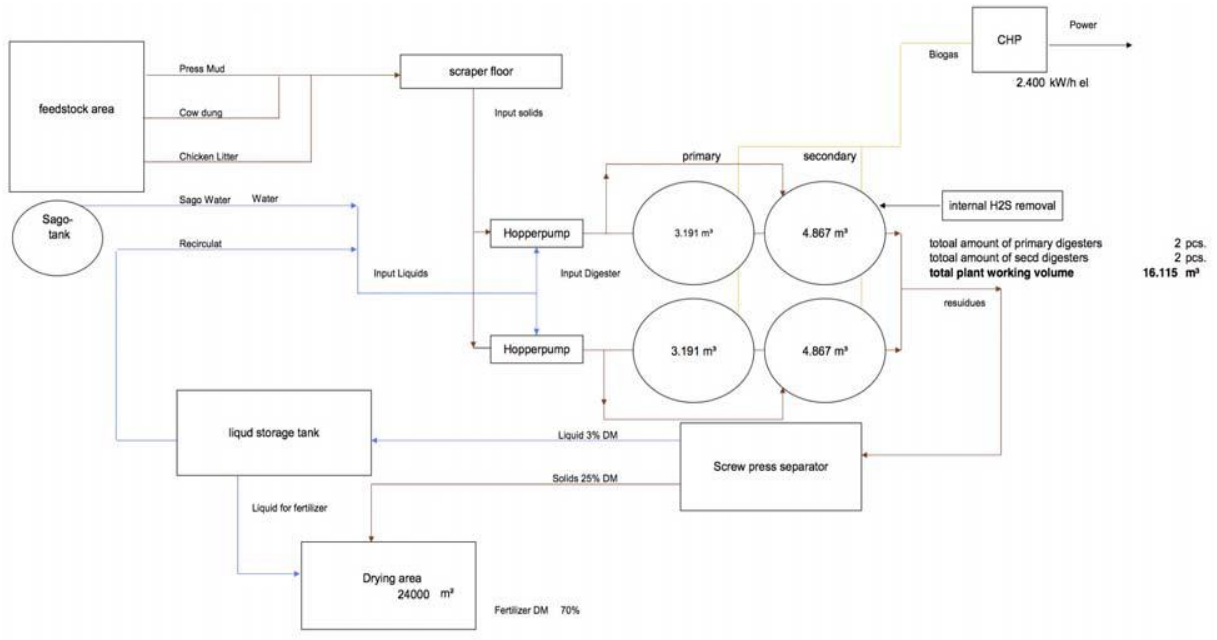
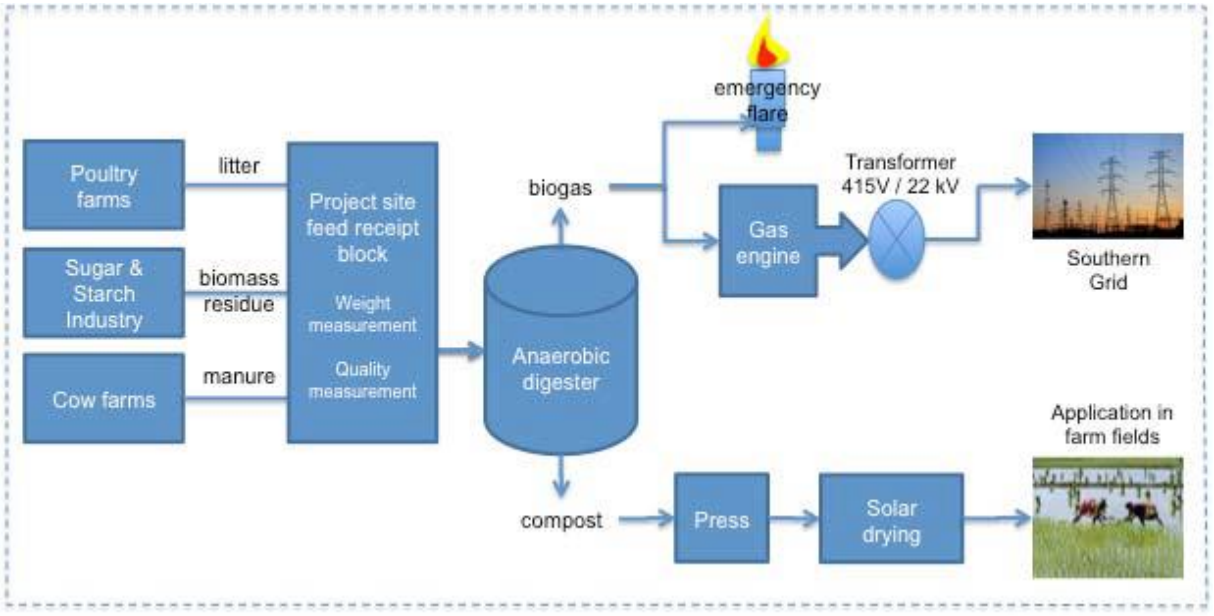
The process scheme applied to project activity is as below





The project facilities were constructed in 2011 and 2012. It has been operational since December 2012. There were no major shutdowns of the plant during this monitoring period.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

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The data for the parameter- ID.23./w_{CH4} (methane %), which does not have any influence on the emission reduction calculation, could not be recorded between the periods May to 01 August 2016 12:10 and 12 August 2016 11:10 to 18 August 2016 11:30 am, and 15 December 2016 to 21 April 2017 because of hardware & software failures from PLC/SCADA system. To be most conservative and to comply with the relevant provision of the project standard v2 the value has been set to “0” for the mentioned period.

The values of the parameter ID.24./$FV_{RG,h}$, ID.25./$BG_{combusted,y}$ and ID.26./$BG_{flared,y}$ were also not recorded as per the set frequency. For the purpose of PE calculation from flaring, the maximum

value out of monitored data has been applied. For the purpose of baseline emission calculation, the totalised value from the flow meters at the end of every month were used.

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B.2.2. Corrections

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The value of the parameter **ID.13./EFCO2,transport** has been made consistent in the PDD.

B.2.3. Changes to the start date of the crediting period

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Not Applicable.

B.2.4. Inclusion of monitoring plan

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Not Applicable.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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As per the PPA (section 4.1 & 4.6), the meter is supposed to be tested/calibrated as per central electricity authority (CEA) regulation therefore the calibration frequency of ID.19./$EG_{BL,y}$ (Net electricity supplied by the project activity to the grid) and ID. 20./$EC_{PJ,y}$(Net electricity imported from the grid in case the Power units are not operating) has been changed to at least once in five years.

B.2.6. Changes to project design

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Not Applicable.

B.2.7. Changes specific to afforestation or reforestation project activity

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Not Applicable.

SECTION C. Description of monitoring system

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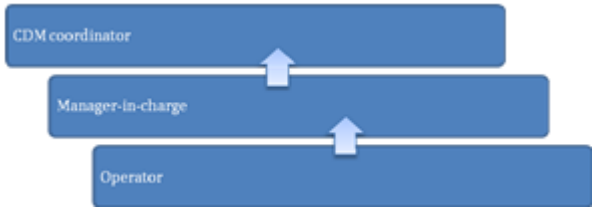
IOT Mabagas will ensure accuracy of the measurement system by adopting the following operational and management structure.

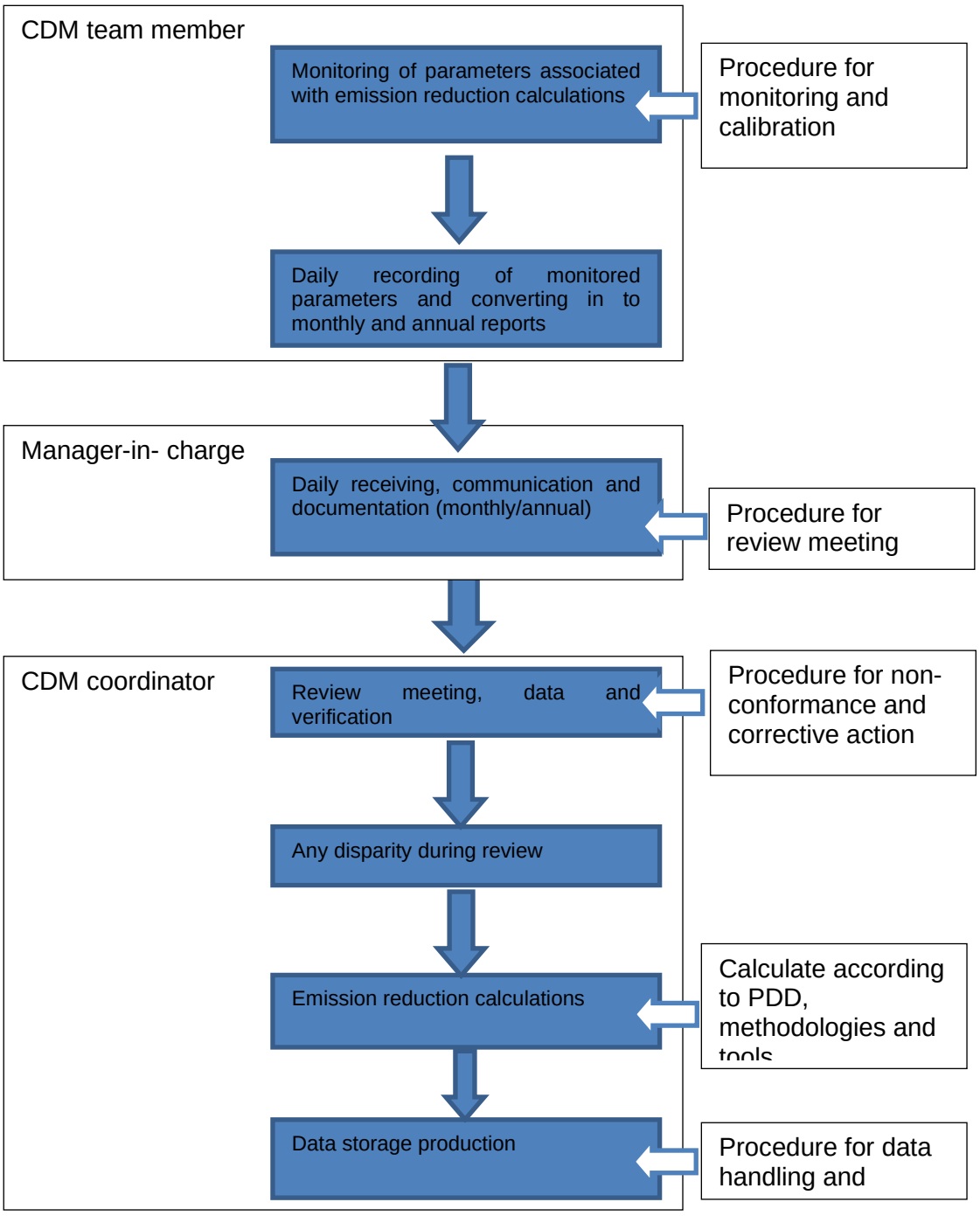


The parameters mentioned above are monitored and recorded electronically and / or in log sheets by the Operator. Based on the logged data recorded in the panel log sheets, a monthly report consisting of above parameters is prepared by the manager-in-charge in a soft copy and is forwarded to the CDM coordinator through email on monthly basis. The report received from respective department through e-mail is compiled by the CDM Coordinator. The reports will be

retained till two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later. A CDM Manual is prepared, which illustrates the detailed roles and responsibilities of individuals involved in the project activity.

To ensure Quality Control and Quality Assurance of the monitored parameters following procedures is adopted:
The data used is reviewed by conducting a inter department review meeting once in 6 months. The CDM Coordinator will discuss the data (received from respective departments) with the Operator of concerned departments. Once data is compiled and checked, it will be handed to verifying DOE for verification.

Flow chart for CDM Data monitoring & recording



Specific monitoring aspects regarding AMS-III.D. Methane recovery in manure management systems – version 1.

The emission reductions achieved by the project activity will be determined ex post through direct measurement of the amount of methane fuelled, flared or gainfully used. It is likely that the project activity involves manure treatment steps with higher methane conversion factors (MCF) than the MCF for the manure treatment systems used in the baseline situation, therefore the emission reductions achieved by the project activity is limited to the ex post calculated baseline emissions minus project emissions using the actual monitored data for

the project activity. The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\begin{bmatrix}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}),(MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{bmatrix}$$

(Equation 19)

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year y (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation 6 using *ex post* monitored values (e.g. Q_y) (tCO_2e)
$PE_{y,ex\ post}$	Project emissions calculated using equation (10) using *ex post* monitored values (e.g. Q_y, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO_2e)
$LE_{y,ex\ post}$	Leakage emissions calculated using *ex post* monitored values (tCO_2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year y (tCO_2e)
$PE_{y,transp,ex\ post}$	Emissions from incremental transportation based on monitored values in the year y (tCO_2e)
$PE_{y,power,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year y (tCO_2e)
$PE_{y,res\ waste,ex\ post}$	Methane emissions from the anaerobic decay/treatment of the residual waste/products based on monitored values in the year y (tCO_2e)
$PE_{y,phy\ leakage,ex\ post}$	Methane emissions from physical leakages of the anaerobic digester based on monitored values in year y (tCO_2e)

Monitoring parameters to determine ex-post methane capture & destroyed (MD_y)

According to paragraph 19 (b) of AMS-III.AO (Version 01): flaring/ combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP\_CH_4$$

(Equation 20)

Where:

$BG_{burnt,y}$	Biogas[89] flared/combusted in year y (m^3)
$w_{CH4,y}$	Methane content in the biogas in the year y (volume fraction)
D_{CH4}	Density of methane at normal conditions (20°C at 1 atmosphere) (tonnes/m^3)
FE	Flare efficiency in the year y (fraction). If the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% may be applied (see parameter ID.14)

As per paragraph 19 (c) of AMS-III.AO (Version 01):

> *The method for integration of the terms to calculate MDy to obtain the results for one year of measurements within the confidence level, as well as the methods and instruments used for metering, recording and processing the data obtained, shall be described in the project design document and monitored during the crediting period;*

The methods and instruments used for metering, recording and processing are described in the relevant parameter boxes for $BG_{flared,y}$, $BG_{combusted,y}$, w_{CH4}, D_{CH4} and FE. The monitored parameters are w_{CH4} (ID.23) $BG_{combusted,y}$ (ID.25), $BG_{flared,y}$ (ID.26) and T_{flare} (ID.29).

ID	Parameter	Description	Measurement point	How monitored
23	w_{CH4}	Methane content in the biogas	Control room	Values are logged every half hour. This results in 17520 measurement points (365 days * 24 hours * 2 measurements per hour) values. These values are then exported using a CSV file into Excel.
25	$BG_{combusted,y}$	The total amount of the biogas combusted	Control room	Values are logged every half hour. This results in 17520 measurement points (365 days * 24 hours * 2 measurements per hour) values. These values are then exported using a CSV file into Excel.
26	$BG_{flared,y}$	The amount of biogas generated that is flared	Control room	Values are logged every half hour. This results in 17520 measurement points (365 days * 24 hours * 2 measurements per hour) values. These values are then exported using a CSV file into Excel.
29	T_{flare}	Temperature in the exhaust gas of the flare	Flare	Using a Type N thermocouple the temperature is monitored continuously; the average value is logged every half hour by the system. This results in 17520 measurement points (365 days * 24 hours * 2 measurements per hour) values. These values are then exported using a CSV file into Excel. Here the project participant checks if they should be taken into account (see parameter box ID.14 FEy) and then averages all values into one annual value.

The data is integrated as per below table. The logged data are matched for each interval. Per interval the FE is determined. The MD is calculated as per equation 23 for each interval. MD_y is calculated by summing all MD values for the monitoring period.

Time interval	BG_{flared}	$BG_{combusted}$	T_{flare}	w_{CH4}	FE	MD
	Monitored	Monitored	Monitored	Monitored	Default (see parameter box ID.14)	Calculated

00:30:00	m3	m3	oC	%	100%; 90%; 50%; 0%	tCO2e
01:00:00	m3	m3	oC	%	100%; 90%; 50%; 0%	tCO2e
Etc.						
Annual Total						**TOTAL** **tCO_2e/y (sum of above)**

Since BG_{flared}, $BG_{combusted}$ and T_{flare} are monitored continuously, confidence level is 100% (no statistical sampling; entire population is measured), hence the results for one year of measurements are within the confidence level.

As per paragraph 19 (d) of AMS-III.AO (Version 01):

> *Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider to apply the flare efficiency to the portion of the biogas used for energy, if separate measurements are not performed; When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy;*

A portion of the biogas is destroyed through flaring and another portion us used for energy generation. Hence:

$BG_{burnt,y} = BG_{combusted.y} + BG_{flared,y}$

Hence equation (18) is rewritten:

$MD_y = (BG_{flared,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}) + (BG_{combusted,y} * w_{CH4,y} * D_{CH4} * GWP_{CH4})$

As per paragraph 19 (e) of AMS-III.AO (Version 01):

> *Flow meters, sampling devices and gas analysers shall be subject to regular maintenance, testing and calibration to ensure accuracy;*

The devices used to monitor the following parameters are subject to regular maintenance, testing and calibration as per §17 of the General Guidelines to SSC CDM methodologies (Version 17):

ID.23	w_{CH4}	gas analyser	see parameter box
ID.24	$FV_{RG,h}$	flow meter	see parameter box
ID.25	$BG_{combusted,y}$	flow meter	see parameter box
ID.26	$BG_{flared,y}$	flow meter	see parameter box

As per paragraph 19 (f) of AMS-III.AO (Version 01):

> *The monitoring plan should include onsite inspections for each individual digester included in the project boundary where the project activity is implemented for each verification period.*

Each individual digester included in the project boundary will be inspected on site for each verification period.

Monitoring requirement for verification of proper soil application.

As per AMS-III.F paragraph 25 the project participant will archive all sales records for the treated residue (compost). The conditions for proper soil application ensuring aerobic conditions have been established by a local expert

Baseline emissions (BE) are discussed in table 4.1.c. in the PDD. Since PP cannot demonstrate the BE for agricultural waste or cow dung, the BE has been set to zero in line with the methodology (conservative approach).
To further show that the methodology is conservative below argument shows that using (Equation 19 will always result in a conservative approach, in line with CDM:

$$ER_{y,ex\ post} = min\begin{bmatrix}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}),(MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{bmatrix}$$

Where:

$ER_{y,ex\ post}$:	ex post Emission reductions achieved by the project activity based on monitored values for year y (tCO_2e)
$BE_{y,ex\ post}$:	ex post Baseline emissions calculated using equation 6 using ex post monitored values (e.g. Q_y) (tCO_2e)
$PE_{y,ex\ post}$:	ex post Project emissions calculated using equation (10) using ex post monitored values (e.g. Qy, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO_2e)
$LE_{,y\ ex\ post}$:	ex post Leakage emissions calculated using ex post monitored values (tCO_2e)
MD_y:	Methane captured and destroyed or used gainfully by the project activity in year y (tCO_2e)
$PE_{y,transp,ex\ post}$:	Emissions from incremental transportation based on monitored values in the year y (tCO_2e)
$PE_{y,power,ex\ post}$:	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year y (tCO_2e)
$PE_{y,res\ waste,expost}$:	Methane emissions from the anaerobic decay/treatment of the residual waste/products based on monitored values in the year y (tCO_2e)
$PE_{y,phy\ leakage,ex\ post}$:	Methane emissions from physical leakages of the anaerobic digester based on monitored values in year y (tCO_2e)

As per the registered PDD, MD_y of the gas will be 7.5 mln m^3 * density * methane content * 21 ~ 65,000 CERs. Equation (6) would result in ~ 13,200 CERs claimed ($BE_{y,expost}$), in which case ER would equal MIN ($BE_{y,expost}$, MD_y) = 13,200 CERs.

$BE_{y,ex\ post}$ will basically always be more conservative than MDy:

- if $Q_{chickenlitter,expost}$ would be 100% of Q_{total} then MD_y would still be approx 65,000 BE would be approx 26,40091;
- hence $BE_{y,ex\ post}$ would still be more conservative;
- if $Q_{chickenlitter,ex\ post}$ would be 0%, then $BE_{y,ex\ post}$ would be 0 CERs.

In every case $BE_{y,expost}$ would be more conservative; hence the project is in line with methodology.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	ID.1./$EF_{grid,CM,y} = EF_{EL,y}$
Unit	tCO_2/GWh
Description	EFy is the CO_2 emission factor of the Southern grid, in which the project activity displaced the electricity during the year y.
Source of data	The CEA CO_2 Emission Database Version 6.0, March 2011
Value(s) applied	865
Choice of data or measurement methods and procedures	Since the CEA is the prime authority for publishing all relevant data regarding the Indian power sector, the choice of the data is conservative. The emission factor is calculated from the CEA's OM and BM values of the Indian regional grid systems. The parameter is calculated according to the guidelines of CDM modalities and procedures.
Purpose of data/parameter	Determination of Baseline Emission
Additional comments	In equation 5 of this PDD defined as $EF_{grid,CM,y}$ and in equation 13 defined as EFEL,y

Data/Parameter	ID.2./$EF_{grid,OM,y}$
Unit	tCO_2/GWh
Description	Operating Margin Emission Factor of the Southern grid.
Source of data	The CEA CO_2 Emission Database Version 6.0, March 2011.
Value(s) applied	966
Choice of data or measurement methods and procedures	Since the CEA is the prime authority for publishing all relevant data regarding the Indian power sector, the choice of the data is conservative. The emission factor is calculated from the CEA's data. The parameter is calculated according to the guidelines of CDM modalities and procedures.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	ID.3./$EF_{grid,BM,y}$
Unit	tCO_2/GWh
Description	Build Margin Emission Factor of the Southern grid.
Source of data	The CEA CO2 Emission Database Version 6.0, March 2011.
Value(s) applied	763
Choice of data or measurement methods and procedures	Since the CEA is the prime authority for publishing all relevant data regarding the Indian power sector, the choice of the data is conservative. The emission factor is calculated from the CEA's data. The parameter is calculated according to the guidelines of CDM modalities and procedures.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	ID.4./GWP_{CH4}
Unit	CH_4
Description	Global Warming Potential (GWP) of methane. The factor describes the conversion of 1 tCH4 into 1 tCO_2equivalent emissions.
Source of data	AMS-III.AO version 01
Value(s) applied	25

Choice of data or measurement methods and procedures	GWP_{CH4} is updated to the value of 25
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.5./D_{CH4} = $\rho_{CH4,n}$**
Unit	kg/m^3
Description	Density of methane at normal conditions (20 ºC and 1 atm) pressure)
Source of data	IPCC 2006 default factor, see Equation 10.23 on pg.10.41 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use.
Value(s) applied	0.67
Choice of data or measurement methods and procedures	The value is taken from the IPCC 2006 tables, see above. In absence of choice of data, the IPCC default value is the best option to use.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	In equation 7 and 20 defined as D_{CH4}; in equation 16 defined as $\rho_{CH4,n}$

Data/Parameter	**ID.6./MCF_j**
Unit	%
Description	Methane conversion factor for manure management. Only for poultry litter.
Source of data	Department of Bioenergy, Tamil Nadu Agricultural University (Tamil Nadu), Methane Emission Potential of Poultry Litter (October 2011)
Value(s) applied	22.84%
Choice of data or measurement methods and procedures	The data is derived from a report from Tamil Nadu Agricultural University based on field studies of a sample of poultry farms in the Namakkal district. This report is the most recent relevant source for the project activity.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID7./$B_{0,\ LT}$**
Unit	$m^3_{CH_4}/kg$
Description	Maximum methane production potential (in the baseline situation). LT = Livestock = poultry.
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories under the volume 'Agriculture, Forestry and other Land use' for 'Emissions from Livestock and Manure Management' Table 10A-9, page 10.82.
Value(s) applied	0.24
Choice of data or measurement methods and procedures	As no country specific factor is available, the IPCC 2006 default factor is used
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.8./$VS_{default}$**
Unit	Kg/head/day
Description	Volatile solids for livestock LT

Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories under the volume 'Agriculture, Forestry and other Land use' for 'Emissions from Livestock and Manure Management', Table 10A-9, page 10.82.
Value(s) applied	0.02
Choice of data or measurement methods and procedures	As no country specific factor is available, the IPCC 2006 default factor is used.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.9./MS%BI,j,y**
Unit	%
Description	Fraction of manure handled in baseline animal manure management system j in year y.
Source of data	Department of Bioenergy, Tamil Nadu Agricultural University (Tamil Nadu), Methane Emission Potential of Poultry Litter (October 2011). Document made available to the DOE as SD_04.
Value(s) applied	100%
Choice of data or measurement methods and procedures	100% of the poultry litter at poultry farms sourced by PP is managed under anaerobic conditions. PP refer to Department of Bioenergy, Tamil Nadu Agricultural University (Tamil Nadu), Methane Emission Potential of Poultry Litter (October 2011). Document made available to the DOE as SD_04.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.10./EFCO2,diesel,y**
Unit	$tCO2_e/TJ$
Description	CO_2 emission factor of diesel used in the year y.
Source of data	IPCC 2006 guidelines.
Value(s) applied	74.8

<table>
<tr><td>Choice of data
or measurement methods
and procedures</td><td>As per tool “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” the following data sources may be used if the relevant conditions apply:

<table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr><tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available

These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr></table>
As Project Participants do not have invoices from suppliers (option a), they have opted for option (d), the IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</td></tr>
<tr><td>Purpose of data/parameter</td><td>Determination of Emission Reductions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data/Parameter	**ID.11./NCV Diesel**
Unit	GJ/t
Description	Net calorific value of diesel.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 1.2
Value(s) applied	43.3

<table>
<tr><td>Choice of data
or measurement methods
and procedures</td><td>As per tool “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” the following data sources may be used if the relevant conditions apply:

<table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source if the carbon fraction of the fuel is not provided (Option A)</td></tr><tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available

These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).</td></tr><tr><td>d) IPCC default values at the upper 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</td><td>If a) is not available</td></tr></table>
As Project Participants do not have invoices from suppliers (option a), they have opted for option (d). The IPCC default values at the upper 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.</td></tr>
<tr><td>Purpose of data/parameter</td><td>Determination of Emission Reductions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data/Parameter	**ID.12./ρ_{diesel}**
Unit	t/m^3
Description	Density of diesel.
Source of data	CEA’s CO_2 Emission Database Version 6.0, March 2011. Appendix B (page 25) of the CO_2 Baseline Database for the Indian Power Sector User Guide, accessed at: http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf
Value(s) applied	0.83

Choice of data or measurement methods and procedures	As per tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" the following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the project participants — If a) is not available c) Regional or national default values — If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances). Since (a) is not available to the PP, option (c) is opted and the value from the Central Electricity Authority (CEA) is used. The CEA is the statutory organisation under Ministry of Power who collects and records data concerning the generation, transmission, trading, distribution and utilization of electricity.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.13./$EF_{CO2,transport}$**
Unit	$kgCO_2/km$
Description	CO_2 emission factor from fuel use due to transportation.
Source of data	Based on 8.25 km/ litre of average fuel consumption ($F_{diesel,avg}$) value determined as per contracts obtained from logistics company
Value(s) applied	0.326
Choice of data or measurement methods and procedures	Transport is subcontracted; value determined as per contracts obtained from logistics company.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.14./$\eta_{flare,h} = FE_y$**
Unit	%
Description	Flare efficiency in hour h based on measurements or default values.
Source of data	Default values given in the Methodological Tool to determine project emissions from flaring gases containing methane (Version 01).
Value(s) applied	90%

Choice of data or measurement methods and procedures	Under the project activity an enclosed flare will be installed. For enclosed flares the Tool to determine project emissions from flaring gases containing methane (Version 01) stipulates two options: a) To use a 90% default value. Continuous monitoring of compliance with manufacturer's specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit of manufacturer's specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour; or b) Continuous monitoring of the methane destruction efficiency of the flare (flare efficiency). For determination of the flare efficiency option (a) – use of default values – has been chosen for the project activity In case of enclosed flares and use of default values the following flare efficiency values shall be applied: • 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500°C for more than 20 minutes during the hour h; • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500°C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h; • 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500°C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h. • As per paragraph 19 (b) of AMS-III.AO (Version 01) if the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% may be applied Based on continuous measured T_{flare}, η_{flare} is determined based upon above default values.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	Used to calculate Project Emissions from flaring ($PE_{flare,y}$) as per Methodological Tool to determine project emissions from flaring gases containing methane (Version 01) (formula 15); Used to calculate Methane destructed in year y (MD_y) as per AMS-III.D (formula 18).

Data/Parameter	**ID.15./$fv_{CH4,RG,h}$**
Unit	mg/m^3
Description	Volumetric fraction of CH4 in the residual gas in the hour h.
Source of data	Page 2, 2nd line below figure 01 of TNAU report
Value(s) applied	60%
Choice of data or measurement methods and procedures	Only used for ex-ante estimation of the methane content in the residual gas since PP opts to use option (a) page 3 of the "Tool to determine project emissions from flaring gases containing methane" (version 01), $fv_{CH4,RG,h}$ is only required in step 5 to calculate the ex-ante value of $TM_{FG,h}$ since under step 6 PP opts to use default values and enclosed flare.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.16./$TDL_{j,y}$**
Unit	-

<table>
<tr><td>Description</td><td>Average technical transmission and distribution losses for providing electricity to source j in year y.</td></tr>
<tr><td>Source of data</td><td>Use as default values of 20% for project or leakage electricity consumption sources as per methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01).</td></tr>
<tr><td>Value(s) applied</td><td>20%</td></tr>
<tr><td>Choice of data
or measurement methods
and procedures</td><td>As per methodological; “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01) in case of scenario B and scenario C, case C.II, assume TDLj/k/l,y = 0 as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options:

• Use recent, accurate and reliable data available within the host country;
• Use as default values of 20% for
(a) project or leakage electricity consumption sources;
(b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.
• Use as default values of 3% for
(a) baseline electricity consumption sources;
(b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.

In light of the options above, Project Participants have opted for the following:

<table><tr><td>TDL,j,y</td><td>Grid</td><td>20%</td><td>as per tool 2nd</td></tr><tr><td></td><td>Gen Set</td><td>3%</td><td>as per tool 3rd bullet option (b) above</td></tr></table></td></tr>
<tr><td>Purpose of data/parameter</td><td>Determination of Emission Reductions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

D.2. Data and parameters monitored

Data/Parameter	**ID.18./EGgross,y**
Unit	GW_h/y
Description	The gross electricity generated by the project activity.
Measured/calculated/ default	Measured
Source of data	Energy meter
Value(s) of monitored parameter	24.601

Monitoring equipment	Energy Meter
Measuring/reading/recording frequency	Monthly Report on PLC
Calculation method (if applicable)	The gross electricity generated by the project activity would be monitored based on an energy meter on the generator panel of the engines which is logged on PLC (programmable logic controller).
QA/QC procedures	The data is monitored continuously. The Operator reports the readings on a monthly basis. Based on the logged data, a monthly report is prepared by Manager-in-Charge and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with the operators of the concerned departments. Accuracy class is 0.2S class as per IEC62053-22. Once the data is compiled and checked, it will be handed over to Verifier for verification. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.19./$EG_{BL,y}$**
Unit	GWh/y
Description	Net electricity supplied by the project activity to the grid.
Measured/calculated/ default	Measured
Source of data	TANGEDCO (Tamil Nadu Generation and Distribution Corporation) report based on this which PP will raise the invoice to TANGEDCO along with duly signed report.
Value(s) of monitored parameter	20.9093
Monitoring equipment	Energy Meter
Measuring/reading/recording frequency	Monthly basis
Calculation method (if applicable)	The energy meter operates continuously. TANGEDCO official will check the energy meter (primary) once per month and the reading will be recorded in the log books. The TANGEDCO official will issue a monthly consumption statement, which will be used as source of data. Based on this statement PP will raise the invoice to TANGEDCO along with the monthly consumption statement.

QA/QC procedures	If primary energy meter fails to read then TANGEDCO will refer the secondary energy meter. If both energy meters fail then source of data will be used from the previous last 3 months reports mutually agreed by PP & TANGEDCO. Based on the logged data, a report is prepared by Manager-in-Charge and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with the operators of the concerned departments. Once the data is compiled and checked, it will be handed over to Verifier for verification. The metering arrangements with facilities to record export and import of energy shall be provided in accordance with the Central Electricity Authority (installation and Operation of Meters) Regulations, 2006, Commission's Intra State Open Access Regulations 2005. Tamil Nadu Electricity Distribution Code, 2004 and Tamil Nadu Grid Code, 2004 in consultation with Distribution Licensee / State transmission Utility. The periodicity of testing, checking, calibration etc., will be governed by the Regulations issued by the Central Electricity Authority / Commission. The energy meters healthiness will be checked by TANGEDCO at regular intervals will be decided by TANGEDCO from time-to-time. The measuring equipment used for monitoring data is calibrated as per manufacturers' specifications, but at least once in five years as per section 4.1 & 4.6 of the PPA.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The above methodology is accepted by PP in EPA signed with TANGEDCO. The data will be archived electronically until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later as per § 17.a of the general guidelines to SSC CDM methodologies (version 17).

Data/Parameter	**ID.20./$EC_{PJ,y}$**
Unit	GWh/y
Description	Net electricity imported from the grid in case the Power units are not operating.
Measured/calculated/ default	Measured
Source of data	TANGEDCO (Tamil Nadu Generation and Distribution Corporation) report based on this which PP will raise the invoice to TANGEDCO along with duly signed report.
Value(s) of monitored parameter	0.02824
Monitoring equipment	Energy Meter
Measuring/reading/recording frequency	Monthly basis

Calculation method (if applicable)	The energy meter operates continuously. TANGEDCO official will check the energy meter (primary) once per month and the reading will be recorded in the logbooks. The TANGEDCO official will issue a monthly consumption statement, which will be used as source of data. Based on this statement TANGEDCO will raise an invoice along with duly signed report if the Net electricity supplied by the project activity to the grid minus the net electricity imported is negative over the reporting period (if more electricity is imported than supplied).
QA/QC procedures	If primary energy meter fails to read then TANGEDCO will refer the secondary energy meter. If both energy meters fail then source of data will be used from the previous last 3 months reports mutually agreed by PP & TANGEDCO. The metering arrangements with facilities to record export and import of energy shall be provided in accordance with the Central Electricity Authority (installation and Operation of Meters) Regulations, 2006, Commission's Intra State Open Access Regulations 2005. Tamil Nadu Electricity Distribution Code, 2004 and Tamil Nadu Grid Code, 2004 in consultation with Distribution Licensee / State transmission Utility. The periodicity of testing, checking, calibration etc., will be governed by the Regulations issued by the Central Electricity Authority / Commission The energy meters healthiness will be checked by TANGEDCO at regular intervals will be decided by TANGEDCO from time-to-time. The measuring equipment used for monitoring data is calibrated as per manufacturers' specifications, but at least once in five years as per section 4.1 & 4.6 of the PPA.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.21./$Q_{i,y}$**
Unit	t/y
Description	Amount of waste type *i* (poultry litter, agricultural wastes, and cow dung) used at the plant.
Measured/calculated/ default	Measured
Source of data	Weigh bridge records.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Weigh bridge
Measuring/reading/recording frequency	Each truck loading is monitored and then monthly reports
Calculation method (if applicable)	All incoming trucks transporting poultry litter shall be directly measured using the onsite weighbridge. The delta in weight between the empty truck and the loaded truck is taken as the weight of the poultry litter.
QA/QC procedures	Each weigh instance is monitored and logged in the log book by the Operator. Based on the logged data, a monthly report is prepared by Manager-in-Charge and is forwarded to CDM Coordinator through email on monthly basis. Once the data is compiled and checked, it will be handed over to Verifier for verification. The measuring equipment (electronic weigh bridge) is designed as per IS: 9281 manufacturing standard specifications (+/- 0.025% of FS). The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions

Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.22./$Q_{res\ waste,y}$**
Unit	t/y
Description	Amount of treated residue (compost) shipped off.
Measured/calculated/ default	Measured
Source of data	Weigh bridge records.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Weigh bridge
Measuring/reading/recording frequency	Each truck, daily report and monthly report
Calculation method (if applicable)	All trucks transporting compost would be measured for both empty weight and also with loaded compost. The difference is the weights would be measured for amount of treated compost shipped off from the plant. This is also substantiated with invoices/payment receipts to the buyers of the treated compost.
QA/QC procedures	Each weigh instance is monitored and logged in the log book on a daily basis by the Operator. Based on the logged data, a monthly report is prepared by the Manager-in-Charge and is forwarded to the CDM Coordinator through email on monthly basis. Once the data is compiled and checked, it will be handed over to the Verifier for verification. The measuring equipment (electronic weigh bridge) is designed as per IS:9281 manufacturing standard specifications (+/- 0.025% of FS). The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.23./w_{CH4}**
Unit	%
Description	Methane content in the biogas (dry).
Measured/calculated/ default	Measured
Source of data	Gas analyser.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Gas analyser
Measuring/reading/recording frequency	Half hourly values, based on which monthly report is generated
Calculation method (if applicable)	Data is monitored continuously. Values are logged every half hour. The CH4 content is analysed by NDIR (non-dispersive infrared sensor) and is hence measured directly and the measurement point is close to the biogas flow rate measurement point (ID.24).

QA/QC procedures	The 30 minutes interval assures a confidence/ precision level higher than the 90/10 level required (see appendix 4 regarding the required sample size). Based on the logged data, a monthly report is prepared by Manager-in-Charge which is forwarded to the CDM Coordinator. The data used is reviewed by conducting a inter department review meeting once in 6 months. Once the data is compiled and checked, it will be handed over to the Verifier for verification. The measuring equipment (Gas analyser) is designed as per ANSI/API RP 555- 2001 manufacturing standard specifications. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later as per § 17.a of the general guidelines to SSC CDM methodologies (version 17). During PLC downtime no records have been taken, which is why a value of "0" has been applied during such periods.

Data/Parameter	**ID.24./$FV_{RG,h}$**
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h*.
Measured/calculated/ default	Measured
Source of data	Flow meter (FT 1202)
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Thermal mass flow meter
Measuring/reading/recording frequency	Half hour values, based on which monthly report is generated from PL
Calculation method (if applicable)	Will be continuously measuring the gas flow rate and the value will be logged in PLC on a half hourly basis. Accuracy measurement: ± 1.8% of reading + 0.1% full scale. PP will ensure that the same basis (dry) is considered for this measurement.
QA/QC procedures	Data is monitored continuously. Values are logged every half hour. Based on the logged data, a monthly report is prepared by Manager-in-Charge which is forwarded to CDM Coordinator. The measuring equipment is designed using IS/ANSI manufacturing standard specifications. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions

Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later as per § 17.a of the general guidelines to SSC CDM methodologies (version 17). In § III of the "Tool to determine project emissions from flaring gases containing methane" (version 01) in the parameter box for $FV_{RG,h}$ under "Measurement procedures" the following sentence is included ("[…] and the measurement of volumetric fraction of all components in the residual gas (fvi,h) when the residual gas temperature exceeds 60o]. Since PP opts to use option (a) page 3 of the "Tool to determine project emissions from flaring gases containing methane" (version 01), this part of the sentence is not relevant and has hence been left out.

Data/Parameter	**ID.25./$BG_{combusted,y}$**
Unit	m^3/y (normalized)
Description	The amount of the biogas combusted, measured on a dry basis.
Measured/calculated/ default	Measured
Source of data	Flow meter (FT 1201)
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Flow meter
Measuring/reading/recording frequency	Half hour values, based on which monthly report is generated from PLC
Calculation method (if applicable)	The quantity of biogas generated is measured using a calibrated flow meter. The flow meter values are logged in the system. The accuracy class of the flow meter for is +0.1% of full scale.
QA/QC procedures	Data is monitored continuously. Values are logged every half hour. Based on the logged data, a monthly report is prepared by Manager-in-Charge which is forwarded to CDM Coordinator. The data used is reviewed by conducting a inter department review meeting once in 6 months. Once the data is compiled and checked, it will be handed over to Verifier for verification. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.26./BGflared,y**
Unit	m^3/y (normalized)
Description	The amount of biogas generated that is flared, measured on a dry basis.
Measured/calculated/ default	Measured
Source of data	Flow meter
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Flow meter (FT 1202)
Measuring/reading/recording frequency	Half hour values, based on which monthly report is generated

Calculation method (if applicable)	The quantity of biogas flared is measured using a calibrated flow meter. The flow meter values are logged in the system. The accuracy class of the flow meter for is ±0.1% of full scale.
QA/QC procedures	Data is monitored continuously. Values are logged every half hour. Based on the logged data, a monthly report is prepared by Manager-in-Charge which is forwarded to CDM Coordinator. The data used is reviewed by conducting a inter department review meeting once in 6 months. Once the data is compiled and checked, it will be handed over to Verifier for verification. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.27./Frequency of tilling**
Unit	Number
Description	Number of times each batch is tilled.
Measured/calculated/ default	measured
Source of data	Plant records (Log book maintained at drying yard).
Value(s) of monitored parameter	Once per day
Monitoring equipment	Hand written log book
Measuring/reading/recording frequency	Once per day
Calculation method (if applicable)	N/A
QA/QC procedures	The Operator reports the readings at each tilling in the plant records, as well as when the sludge is removed. Based on the logged data, a monthly report is prepared by the Manager-in-Charge and is forwarded to the CDM Coordinator. The data used is reviewed by conducting a inter department review meeting once in 6 months. Once the data is compiled and checked, it will be handed over to the Verifier for verification. The measuring equipment used for monitoring data is calibrated as per manufacturers specifications, but at least once in three years as per § 17.c of the general guidelines to SSC CDM methodologies (version 17).
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.28./FC_{Diesel}**
Unit	Litres
Description	Amount of diesel consumption for operation at site for e.g. tillers and diesel generator set.
Measured/calculated/ default	Calculated
Source of data	Plant records
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	NA
Measuring/reading/recording frequency	Daily monitoring and Monthly compilation

Calculation method (if applicable)	Consumed during operation of tillers and DG set at the site.
QA/QC procedures	This can be cross checked with the fuel receipts / invoices raised.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.29./T_{flare}**
Unit	°C
Description	Temperature in the exhaust gas of the flare.
Measured/calculated/ default	Measured
Source of data	Measurements by project participants.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Type N thermocouple
Measuring/reading/recording frequency	Half hour values, based on which monthly report is generated from PLC
Calculation method (if applicable)	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500°C indicates that a significant amount of gases are still being burnt and that the flare is operating.
QA/QC procedures	Data is monitored continuously. Values are logged every half hour. Based on the logged data, a monthly report is prepared by the Accounts Manager in hard or soft copy and is forwarded to the CDM Coordinator through email on monthly basis. Once the data is compiled and checked, it will be handed over to the Verifier for verification. The thermocouples are manufactured as per ANSI standard specifications. Thermocouples are replaced or calibrated every year as per the manufacturer recommendations.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	An excessively high temperature at the sampling point (above 700 °C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow. The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	**ID.30./$N_{LT,y}$**
Unit	Individual bird.
Description	Livestock population.
Measured/calculated/ default	Measured
Source of data	Based on back-calculation of poultry litter requirement of the plant (i.e. design capacity) and average generation data (i.e. 40g/head/day)
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	NA
Measuring/reading/recording frequency	Annual report

Calculation method (if applicable)	As per report from Tamil Nadu Agricultural University, poultry produces 35 – 40 grams of litter per day per head. The value $N_{LT,y}$ is determined through back-calculation of the poultry litter requirement of the plant on an annual basis. In addition, each farm has records for its livestock population. Through sampling, the records can be compared with sales records of manure from the respective farm and the data can be compared to calculate livestock population.
QA/QC procedures	The consistency between these values and indirect information (records of sales, records of food purchases) shall be assessed. Significant changes in livestock population will be explained.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later. For 100% of the population the used value is then based on the following back calculation: ~ 2.5 million heads * ~ 40 grams per head per day * 365 operational days ≈ 37,000 tonne of poultry litter per year. As the animal manure is not treated in different treatment systems, the parameter MS%i,y doesn't have to be monitored as is defined in section 26 no. 15 of AMS-III.D version 18.

Data/Parameter	**ID.31./$DAF_{w,i}$**
Unit	km/truck
Description	Average incremental distance for waste type *i* (poultry litter, agricultural waste and cow dung) transportation.
Measured/calculated/ default	Measured
Source of data	Records (TRIPSHEETS) showing from which location the waste originates.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Plant records
Measuring/reading/recording frequency	Sampling from complete set of records of each truck loading
Calculation method (if applicable)	Since PP cannot calculate the baseline distance; PP has opted to monitor (sample) the distances and use the sampled values without subtracting the baseline (original) distance. The distance travelled by each type of waste is determined on sample basis and same distance is considered for respective type of waste transported. Please refer excel sheet of ER calculations for the distances considered for each type of waste.
QA/QC procedures	Records (TRIPSHEETS) showing from which location the waste originates. Through statistically sound sampling the distance between those locations and the project (plant) site is determined and verified. The distance considered for project emissions are without subtracting any baseline distance, thus conservative in nature. Also sample size is selected to achieve 90/10 confidence precision level. The average value of distance is considered for project emission calculations.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.32./$DAF_{res\ waste}$**
Unit	km/truck
Description	Average incremental distance for compost transportation.

Measured/calculated/ default	Measured
Source of data	Records i.e. TRIPSHEETS
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Plant records
Measuring/reading/recording frequency	Sampling from complete set of records of each truck loading
Calculation method (if applicable)	The distance travelled by compost is determined on sample basis and same distance is considered for emission due to transportation. Please refer excel sheet of ER calculations for the distances considered for organic compost.
QA/QC procedures	The location of each batch of compost sold will be registered and documented via sales records and TRIPSHEETS. The distances from the project (plant) site to these sample soil application locations of the compost are averaged and cross-referenced with the compost sales records. The sample size is selected to achieve 90/10 confidence precision level. The average value of distance is considered for project emission calculations.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	-

Data/Parameter	**ID.33./APP_{comp}**
Unit	%-age
Description	Proper application of compost
Measured/calculated/ default	Measured
Source of data	An external local expert shall execute the sampling.
Value(s) of monitored parameter	Refer Emission Reduction Sheet to get values for different period
Monitoring equipment	Plant records
Measuring/reading/recording frequency	Sampling from complete set of records of each truck loading
Calculation method (if applicable)	The soil application should be monitored to ensure that there is proper application of compost. A sample of 20 hectares of land per annum to check on proper application of compost and condition during application which does not lead to any further emissions. Final crop for which compost is used should be recorded.
QA/QC procedures	The location of each batch of compost sold will be registered and documented via sales records and TRIPSHEETS. A statistically sound test sample land area totalling 20 hectares is determined from locations where soil application of the compost takes place.
Purpose of data/parameter	Determination of Emission Reductions
Additional comments	The data will be archived until two years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later as per § 17.a of the general guidelines to SSC CDM methodologies (version 17).

D.3. Implementation of sampling plan

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The purpose of sampling is to obtain unbiased and reliable estimates of the mean value of parameters used in the calculations of greenhouse gas emission reductions. 'Unbiased' in this case indicates that the sampling will not systematically underestimate or overestimate the mean value determined. The design of the sampling plan follows the outline set in

Appendix 3 of the 'standard for sampling and surveys for CDM project activities and programme of activities (Version 2.0)'.

The sampling plan contains information relating to: (a) sampling design; (b) data to be collected; and (c) implementation plan.

(a) Sampling design

(i) Objectives and Reliability Requirements

Objective of determining the**:**

1. Average incremental distance for waste type i (poultry litter, agricultural waste and cow dung) transportation ($DAF_{w,i}$)
2. Average incremental distance for compost transportation ($DAF_{res\ waste}$)
3. Compost application (APP_{comp})

These values are determined for every monitoring period. As there is no specific guidance in the applicable methodologies, project proponents will use 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities as per paragraph 9 of the Standard for sampling and surveys for CDM project activities and programme of activities (Version 2.0).

(ii) Target Population

Target population for $DAF_{w,i}$ comprises the incremental distances (in kilometres) the incoming waste streams (in tonnes) are transported under the project activity. The waste will be transported using trucks. The average capacity is 8 tonnes per truck (CT_y; monitored). The incoming waste **(Q_y; monitored) = 246,538 tonnes**, hence an approximate 21,314 truck movements will be required. These consist of the following waste types (stata):

Waste type ($Q_{y,i}$)	Tonnes	Annual truck movements (rounded)
$Q_{y,poultry\ litter}$	28,956	2,391
$Q_{y,\ press\ mud}$	84,361	3,898
$Q_{y,\ sogo\ water}$	37,217	2,757
$Q_{y,black\ thippi}$	742	93
$Q_{y,cow\ dung}$	262	25
Total (rounded up)	151,538	9,164

For compost application the volume is approximately 110,000 hectares on which the compost is applied. This compost is expected to be very homogeneous throughout the year.

(iii) Sampling Method

Parameter	Sampling Method	Comment
DAF#	Stratified Random Sampling	The average incremental distance is expected to be different for each strata (but homogeneous within the strata).

$DAF_{w, poultry}$	Stratum	
$DAF_{w,cow\ dung}$	Stratum	
$DAF_{w, agri}$	Stratum	
$DAF_{res, waste}$	Simple Random Sampling	The average incremental distance is expected to be homogeneous within sample group.
$APP_{comp\ Compost\ application}$	Simple Random Sampling	The application is expected to be homogeneous within sample group.

(iv)Sample Size

The sample size is determined based on a 10% error margin at 90% confidence level. Per sample (or stratum) the sample size is determined based on the formula for either percentage data or numerical data. As per Annex 4 of registered PDD, the sample size is determined based on population (N) i.e number of truck movements and for current entire monitoring period, the sample size selected are more than required as compared with number of truck movements. The distance considered for project emissions are without subtracting any baseline distance, thus conservative in nature. Also sample size is selected to achieve 90/10 confidence precision level. The average value of distance is considered for project emission calculations. Please refer excel sheet for 90/10 confidence/precision level.

(v) Sampling Frame

Parameter	**Sampling Frame**
DAF_w	
$DAF_{w, poultry}$	records of all incoming trucks from poultry farms (Trip sheet)
$DAF_{w,cow\ dung}$	records of all incoming trucks from dairy farms (Trip sheet)
$DAF_{w, agri}$	records of all incoming trucks from agri waste factories (Trip sheet)
$DAF_{res, waste}$	records of outgoing trucks carrying compost (Trip sheet)
APP_{comp}	records of outgoing trucks carrying compost (Trip sheet)

(b) Data

(i) Field measurements

Parameter	**Field measurements**
DAF_w	
$DAF_{w, poultry}$	the samples are selected randomly from the sample frame. The travelled distance will be determined based on GPS/Google Maps directions or similar of the shortest route between the respective poultry farm and the site.
$DAF_{w,cow\ dung}$	the samples are selected randomly from the sample frame. The travelled distance will be determined based on GPS/Google Maps directions or similar of the shortest route between the respective poultry farm and the site.
$DAF_{w, agri}$	the samples are selected randomly from the sample frame. The travelled distance will be determined based on GPS/Google Maps directions or similar of the shortest route between the respective factory and the site.

$DAF_{res, waste}$	During operations the samples are selected randomly from the sample frame. The distance will be measured/recorded to derive the incremental distance.
APP_{comp}	See Tide report [source] for data form.

(ii) Quality Assurance/Quality Control

The following Quality Assurance/Quality Control procedures have to be in place**.**

Table 9: QA/QC

Parameter to be sampled	Quality Assurance/Quality Control
DAF_{w}	Tripsheet data will be checked on regular basis by Manager in Charge and during the interdepartmental review meeting by the CDM coordinator as per PDD
$DAF_{w, poultry}$	Tripsheet data will be checked on regular basis by Manager in Charge and during the interdepartmental review meeting by the CDM coordinator as per PDD
$DAF_{w,cow\ dung}$	Tripsheet data will be checked on regular basis by Manager in Charge and during the interdepartmental review meeting by the CDM coordinator as per PDD
$DAF_{w, agri}$	If the DAFres, waste value calculated based on the samples is larger than the expected value (50km), then the larger value will be used as the new value for DAFres, waste.
$DAF_{res, waste}$	For each improper soil application determined, the related leakage emissions will be calculated and taken into account when claiming emission reductions.

(iii) Analysis: Describe how the data will be used

Parameter to be sampled	How data will be used
$DAF_{w,i}$	The average value calculated from the sample size will be used as $DAF_{w,i}$ value
$DAF_{res, waste}$	The maximum value calculated from the sample size is used as conservative approach
APP_{comp}	Data will be used to conclude that soil is properly applied.

(c) Implementation

The PP will train the CDM team members to perform the sampling. The sampling will be embedded in the operational procedures and in the monitoring plan as per PDD.

Verification
Based on the data gathered a written monitoring report will be provided to the verifying DOE to demonstrate compliance with the monitoring requirements corresponding to the preceding monitoring period.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>>

Baseline emissions:

Baseline emissions from electricity generation

$EG_{BL,y}$: 2015 - 3.08684 GWh/y 2016 - 10.48580 GWh/y 2017 – 7.3366 GWh/y Total – 20,9093 GWh/y
$EF_{CO2,grid,y}$: 865 $tCO_2/GWh_{ex\ ante}$
Calculations
$BE_{Elec,y} = EG_{BL,y} * EF_{CO2,grid,y}$
Results
$BE_{Elec,y}$ = 18,086 tCO_2

Baseline emissions from poultry litter:

The table below provides the quantities of substrate to the anaerobic digester:

Sr. No.	Waste	Quantity
1	Poultry Litter	28,956
2	Agricultural biomass residue	84,361
3	Cow Dung	262
4	Sago water / Juice Effluent	37,217
5	Black Thippi	742

The table below provides the overview of data used to determine the baseline emission related to avoidance of methane production:

Input data			
Variable	**Value applied**	**Unit**	**Source**
$VS_{default}$	0.02	kg	IPCC
days per year	365	d	Default
Calculations			
$VS_{LT,y}$ = $VS_{default}$ * 365			
Results			
$VS_{LT,y}$ = calculated month wise, please refer ER calculation sheet			

Input data			
Variable	**Value applied**	**Unit**	**Source**
GWP_{CH4}	25	-	IPCC and CDM guideline

D_{CH4}	0.67	kg/m^3	ex-ante; see parameter ID.5 in § B.6.2
UF_b	0.94	-	ex-ante; Model correction factor to account for model uncertainties (0.94)[1]
MCF_j	22.84	%	ex-ante; see parameter ID.6 in § B.6.2
B_0, LT	0.24	m^3CH4/Kg	ex-ante; see parameter ID.7 in § B.6.2
$N_{LT,y}$	23,778,666.98	birds	Calculated
$VS_{LT,y}$	-	kg/yr	Calculated above, refer ER calculation sheet
$MS\%_{BI,u}$	100%	-	ex-ante
Calculations			
$BE_{manure,\,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,\,LT} * N_{LT,\,y} * VS_{LT,\,y} * MS\%_{BI,\,j\,j,\,LT}$			
Results			
$BE_{manure,y}$ = 12,495 tCO_2			

Hence baseline emissions are:

Input data
$BE_{Elec,y}$ = **18,086 tCO_2**
$BE_{manure,y}$ = **12,495 tCO_2**
Calculations
$BEy = BE_{Elec,y} + BE_{manure,y}$
Results
BE_y = 30,582 tCO_2

Above mentioned calculation is as per Registered PDD.

For review the actual emission reductions kindly refer the emission reduction sheets. Following are the results of it as–

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

Table

S.No	Month	A	B	C=A+B	D	E	F=D+E	G=C-F
		BE (AMS I D)	BE (AMS III A O)	BE	PE (AMS I D)	PE (AMS III A O)	PE	ER
		tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
1	Aug-15	577.65	463.18	1040.83	0	175.01	175.01	865.82
2	Sep-15	642.35	516.99	1159.34	0	161.93	161.93	997.41
3	Oct-15	572.66	501.31	1073.97	0	206.05	206.05	867.93
4	Nov-15	447.41	430.62	878.03	0	162.48	162.48	715.55
5	Dec-15	430.04	420.43	850.47	0	177.73	177.73	672.74
6	Jan-16	625.50	442.75	1068.25	0	236.21	236.21	832.04
7	Feb-16	524.81	439.87	964.68	0	204.26	204.26	760.42
8	Mar-16	802.62	523.44	1326.05	0	70.35	70.35	1255.70
9	Apr-16	949.39	562.49	1511.88	0	332.64	332.64	1179.24
10	May-16	838.01	575.93	1413.94	0	972.77	972.77	441.17
11	Jun-16	680.10	410.33	1090.43	0	941.15	941.15	149.29
12	Jul-16	474.89	509.59	984.47	0	982.42	982.42	2.06
13	Aug-16	786.70	587.56	1374.26	0	524.93	524.93	849.32
14	Sep-16	598.10	575.96	1174.06	0	293.36	293.36	880.70
15	Oct-16	902.58	619.89	1522.46	0	333.18	333.18	1189.29
16	Nov-16	878.77	578.07	1456.84	0	322.35	322.35	1134.50
17	Dec-16	1008.76	528.02	1536.79	0	640.65	640.65	896.13
18	Jan-17	992.05	429.35	1421.40	0	981.76	981.76	439.64
19	Feb-17	518.55	419.11	937.66	0	879.89	879.89	57.77
20	Mar-17	498.27	506.80	1005.07	0	976.82	976.82	28.26
21	Apr-17	1014.78	514.83	1529.62	0	743.55	743.55	786.07
22	May-17	877.87	485.16	1363.03	0	296.85	296.85	1066.18
23	Jun-17	900.29	428.75	1329.04	0	293.88	293.88	1035.16
24	Jul-17	798.84	478.76	1277.60	0	238.46	238.46	1039.15
25	Aug-17	745.55	546.60	1292.15	0	240.14	240.14	1052.01

E.2. Calculation of project emissions or actual net removals

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Please refer to Section E.1 and Table .

The project emissions are due to electricity import from grid, diesel consumption in DG set, emissions due to transportation of waste used for project activity and residual waste compost transportation. The project emissions due to flaring are also calculated as per registered PDD.

The below formulas are used for the calculations of project emissions due to project activity.

$$PE_y = \left\{ \begin{matrix} PE_{transp,y} + PE_{power,y} + PE_{res\ waste,y} \\ + PE_{phy\ leakage,y} + PE_{flaring,y} \end{matrix} \right\} \quad \textbf{(Equation 10)}$$

$$PE_{power} = PE_{power\_own\ gen} + PE_{power\_elec} + PE_{power\_DG} \quad \textbf{(Equation 12)}$$

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{i,y}) \quad \textbf{(Equation 13)}$$

$$PE_{power\_DG} = PE_{FC,j,y}$$

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(Equation 14)}$$

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO2,transport} + (Q_{res-waste,y} / CT_{res-waste,y}) * DAF_{res-waste} * EF_{CO2,transport}$$

(Equation 11)

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

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$$

As per ER calculations sheet,

$PE_{transport,y}$	= 301.86 tCO_2e
$PE_{power,y}$	= 252.24 tCO_2e
$PE_{phy,leakage,y}$	= 10,231.61 tCO_2e
$PE_{flaring,y}$	= 603.30 tCO_2e
Total project emissions	= 11,388.80 tCO_2e (Round up value)

As per equation 19 of the registered PDD,

$$ER_{y,ex\ post} = min\left[\begin{array}{l}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{array}\right]$$

(Equation 19)

Though the registered PDD mentioned that in every case $BE_{y,expost}$ would be more conservative, the ex post emission reductions are compared as per equation 19 of the registered PDD resulting in the below.

As per above formula,	**Value**	**Unit**
MDy	30,499	**tCO2e**
PE power ex post	252	**tCO2e**
PE transport ex post	302	**tCO2e**
PE y,res waste, ex post	0	**tCO2e**
PE y,phy leakage	10,232	**tCO2e**
LE y,ex post	0	**tCO2e**
First Formula calculations	**19,193**	**tCO2e**
As per above formula,		
Second formula Calculations	19,713	**tCO2e**
ER ex post , Minimum of first formula and second formula	**19,193**	**tCO2e**

Calculation of leakage emissions
As per registered PDD and methodology applied leakage emissions are considered zero.

E.3. Calculation of leakage emissions

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E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	30,582	11,388.82	0	0	19,193	19,193

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
19,193	46,608

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

>>
For the purpose of ex-ante calculation, a design production scenario was used. This scenario turned out to be too optimistic regarding biogas and renewable electricity generation. The relevant values applied for the determination of emission reductions in the PDD are therefore much higher as compared to the figures achieved during the monitoring period.

E.6. Remarks on increase in achieved emission reductions

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Due to a lower Plant Load Factor, emission reductions are less than estimated ex-ante.

E.7. Remarks on scale of small-scale project activity

>>
N.A.

Appendix: Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	IOT Mabagas Limited (IML)
Street/P.O. Box	103
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Fax	
E-mail	marketing.india@oiltanking.com
Website	www.iotinfraenergy.com
Contact person	
Title	Chief Operating Officer
Salutation	Mr.
Last name	Maheswaran
Middle name	
First name	R.
Department	Energy
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Direct fax	
Direct tel.	
Personal e-mail	Maheswaran.r@iotl.com

Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Carbonbay GmbH & Co. KG
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Contact person	Wolfgang Brueckner
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First name	Wolfgang
Department	

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Direct tel.	
Personal e-mail	wolfgang.brueckner@carbonbay.com

Annex 1 : Details of monitoring equipment and calibration details

ID.19,20	Net Electricity Export & Import		Gross Electricity Generated
	Main Meter	**Check Meter**	Energy Meter
Measuring Instrument	Energy Meter, 0.2s	Energy Meter, 0.2s	Energy Meter, 0.5s
Serial Number	TNE59496	TNE59499	205229/270-3310
Class	0.2s	0.2s	0.5s
Make	Secure Meters Ltd	Secure Meters Ltd	Conzerv-EM 6400
Calibration Frequency	5 years	5 years	3 years
Calibration date	30-Aug-12	27-Aug-12	18-Aug-2018
Calibration due date	29-Aug-17	26-Aug-17	17-Aug-2021

Note – The calibration certificates for Gross electricity generation meter are not available before August 2018, this parameter is not considered for ER calculation, thus there is no use to apply any error factor for the readings of this parameter.

ID. 21,22	Weigh Bridge 1	Weigh Bridge 2
Measuring Instrument	Weigh Bridge	Weigh Bridge
Machine Number	RH 1151	RH 1152
Class	+/-0.025% of FS	+/-0.025% of FS
Make	Ricelake Weighing Systems	Ricelake Weighing Systems
Calibration Frequency	3 years	3 years
Calibration date	22-Aug-13, 26-Aug-15	22-Aug-13, 26-Aug-15
Calibration due date	21-Aug-16, 25-Aug-18	21-Aug-16, 25-Aug-18

ID. 23./	wCH4 Methane content in the biogas (dry).
Measured	Gas Analyzer
Unit	%
Serial Number	94116
Make	Union Instruments GmbH, INCA4001 T100-02
Calibration Frequency	3 years
Calibration date	25-Sep-12, 21-Sep-16
Calibration due date	24-Sep-15, 20-Sep-19

Note: Due to late calibration of the gas meter the maximum permissible error of +1% has been applied to parameter ID.23 in periods without valid calibration 24/09/2015 to 21/07/2016. During PLC downtime no records have been taken, which is why a value of “0” has been applied during such periods.

ID. 24. Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h.	
ID. 26. The amount of biogas generated that is flared, measured on a dry basis	
Measuring Instrument	Flow Meter (FT 1202)
Unit	m3/hr

Serial Number	HAO 3CE02000
Class	+/-1.8% of reading +0.1% full scale
Make	Endress + Hauser
Calibration Frequency	3 years
Calibration date	30-Oct-13, 17-Jan-17
Calibration due date	30-Oct-16, 16-Jan-20

Note: Due to late calibration the maximal permissible error of 1.8% was applied to the period without valid calibration.

ID. 25. Amount of the biogas combusted, measured on a dry basis	
Measuring Instrument	Flow Meter (FT 1201)
Unit	m3/year
Serial Number	HAO 3CF2000
Class	+/-0.1% of full scale
Make	Endress + Hauser
Calibration Frequency	3 years
Calibration dates	31-Oct-13, 17-Jul-17, 20-Jun-18
Calibration due date	30-Oct-16, 17-Jul-18;19-Jun-19

Note: Due to late calibration the maximal permissible error of 1.0% was applied to the period without valid calibration.

ID. 29. Temperature in the exhaust gas of the flare.	
Measuring Instrument	Thermocouple
Unit	Deg c
Serial Number	10-TC-80322, 10-TC-80323, 10-TC-80324, 10-TC-80325
Make	Tempsens
Calibration Frequency	1 year
Calibration date	5-Jun-14, 31-Dec-15, 17-Jan-17,
Calibration due date	4-Jun-15, 31-Dec-16, 16-Jan-18

Note: Due to late calibration of the thermocouples the maximum error of -2.2 °C has been applied to parameter ID.29 for periods without valid calibration (05/06/2015 to 30/12/2015 and 01/01/2017 to 17/01/2017)

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Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).

Version	*Date*	*Description*
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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