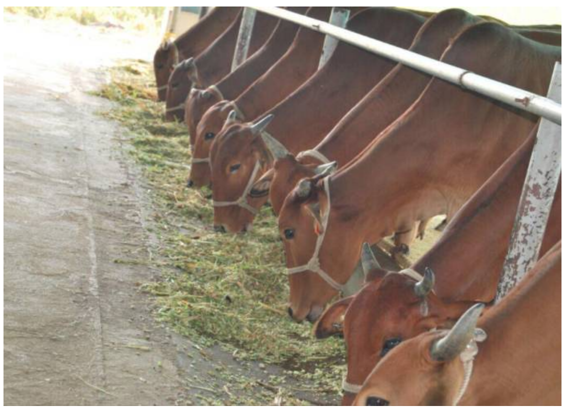
PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT



Title: PoA Cattle Dung Biogas to Power, Maharashtra

Version 1.0

Date 31/10/2021

First CoU Issuance Period: 7 years, 10 months

Date: 01/01/2014 to 31/10/2021

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

BASIC INFORMATION	
Title of the project activity	PoA Cattle Dung Biogas to Power, Maharashtra
Scale of the project activity	Small Scale
Completion date of the PCN	31/10/2021
Project participants	Urja Bio System Pvt. Ltd., Pune, Maharashtra, India
Host Party	India
Applied methodologies and standardized baselines	AMS.I.C. Thermal energy production with or without electricity UCR Protocol Standard Baseline AMS-III.D: Methane recovery in animal manure management systems
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources) 13 Waste handling and disposal
Estimated total average GHG emission reductions	200356 CoUs (200356 tCO_{2eq})

SECTION A. Description of project activity

A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The project **PoA Cattle Dung Biogas to Power, Maharashtra** is located across 13 Villages in the State of Maharashtra, India.

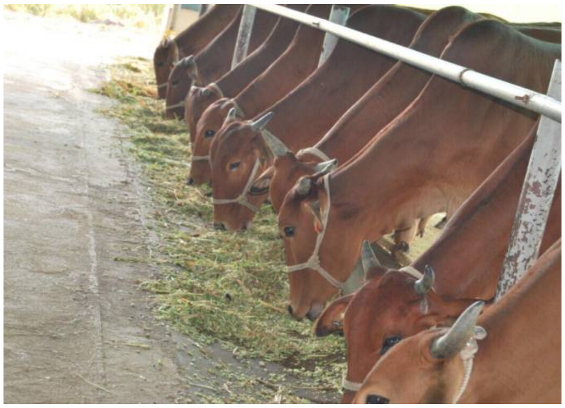
The details of the registered project are as follows:

Purpose of the project activity:

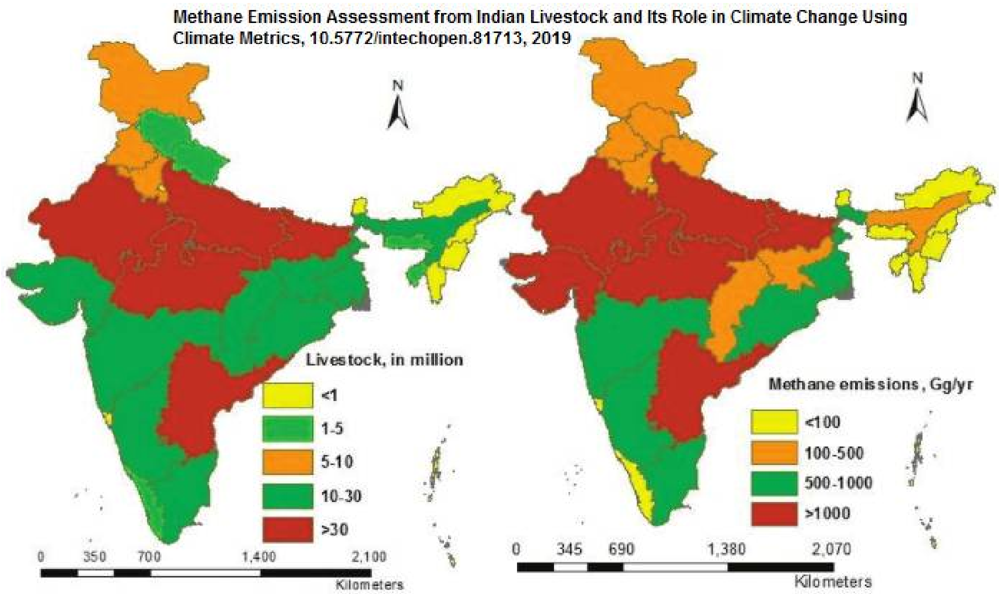
The **PoA Cattle Dung Biogas to Power, Maharashtra** is located across the following Districts: Marathwada, Nashik, Pune, Raigad and Osmanabad, State: Maharashtra, Country: India. The project activity qualifies under the programme of activities (PoAs) and involves the installation of 13 independent biogas digesters beginning 15/06/2009. The purpose of the PoA is the set up independent biogas plants (digesters) between the 50 m^3 , 100 m^3 (2nos), 200m^3 (4nos), 300 m^3 (2nos), 500 m^3, 800 m^3 and 1000 m^3 (2nos) capacity range, for serving the captive electricity needs at the location of the PoA. Fresh cattle dung is fed into the anaerobic digesters.

Sr no	Name of client	location	State	Use of biogas	Commissioning Date
1	MGM college	Aurangabad	Maharashtra	Power 25kW	15/06/2009
2	Surendra Girme	Pune	Maharashtra	Power , 36 KW	22/12/2013
3	Amey Balasaheb Patil	Osmanabad	Maharashtra	Power , 36 KW	27/04/2014
4	Modern Dairy	Nashik	Maharashtra	Power , 24 KW	30/05/2015
5	Sarda Dairy	Nashik	Maharashtra	Power , 120 KW	07/02/2016
6	Parbhani Agro tech	Jalna	Maharashtra	Power , 50 KW	21/09/2016
7	Govind Baug	Baramati	Maharashtra	Power , 12 KW	21/12/2016
8	BAIF	Pune	Maharashtra	Power , 10 KW	30/01/2017
9	Deepak kargal	Shirur	Maharashtra	Power , 12 KW	23/08/2017
10	Sandeep Ghojge	Talegaon , Pune	Maharashtra	Power , 24 KW	08/05/2019
11	Novosera Raut Serum	Pune	Maharashtra	Power , 100 KW	28/09/2019
12	Aba Sutar	Chale, Pune	Maharashtra	Power , 24 KW	25/04/2020
13	KVK	Baramati	Maharashtra	Power 100kw	27/10/2021

The PoA covers project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and gainful use of the recovered methane to generate captive power. There is no regulation in India, applicable to the PoA, that requires the collection and destruction of methane from livestock manure. In the absence of the PoA, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. The PoA recovers and utilizes biogas for producing electricity for captive use and hence displaces electricity from the grid using fossil fuels. The PoA hence avoids CH_4 and CO_2 emissions and is beneficial to the environment and community.



Worldwide, agricultural operations are becoming progressively more intensive to realize economies of production and scale. The pressure to become more efficient drives significant operational similarities between farms of a “type,” as inputs, outputs, practices, genetics, and technology have become similar around the world. This is especially true in livestock operations (swine, dairy cows, etc.) which can create profound environmental consequences, such as greenhouse gas emissions, odour, and water/land contamination (including seepage, runoff, and over application), that result from storing (and disposing of) animal waste.



India has the some of the world's largest livestock population at 500 million heads. Methane has a warming potential 21 times higher than carbon dioxide. Better livestock management can reduce atmospheric methane levels. Livestock emissions worldwide – from manure and gastroenteric releases – account for roughly 32 per cent of human-caused methane emissions. Methane has accounted for roughly 30 per cent of global warming since pre-industrial times and is proliferating faster than at any other time since record keeping began in the 1980s. In fact, according to data from the United States National Oceanic and Atmospheric Administration, even as carbon dioxide emissions decelerated during the pandemic-related lockdowns of 2020, atmospheric methane shot up.

Approximate biogas production rates of different waste	Biogas per day (m3 /day) generation capacity
Cattle dung 1 TPD	50 m3

The dairy farmers in the region can be classified as small to medium-level farmers who are feeding a combination of green fodder and crop residues. Feed intake is typically measured in terms of gross energy (eg., megajoules (MJ) per day) or dry matter (eg. kilograms (kg) per day).

Number Annually within PoA	2014	2015	2016	2017	2018	2019	2020	2021
Cattle	1070	1370	2703	3569	3835	3835	5700	6766

Type of waste	Estimated TPD treated in the PoA
Cattle dung	100 TPD

A.2 Do no harm or Impact test of the project activity>>

There are social, environmental, economic and technological benefits which contribute to sustainable development.

- **Social benefits:**
- Reduces outdoor air pollution, thus eliminating health hazards for people in the vicinity.
- The project provides security of energy supply since it generates biogas based electricity
- It leads to better waste management thus keeping the surroundings clean and reduce some of the disease causing pathogens
- Biogas allowed farms in the PoA to become self-sufficient in power and monetise their waste.

- **Environmental benefits:**
- While carbon dioxide remains in the atmosphere for hundreds to thousands of years, it takes only about a decade for methane to break down. So, reducing methane emissions now would have an impact in the near term and is critical for helping keep the world on a path to 1.5°C.
- Further, by generating electricity through utilising the biogas, the project helps in replacing fossil fuel intensive power generation from the local grid.
- Biogas is environmentally friendly and does not release as many greenhouse gases when burned compared to other fuels
- Leads to soil improvement by providing high quality manure to farmers from waste stream.
- Reduces outdoor air pollution, and increases use of manure rather than chemical fertilizers.
- Using biogas as an energy resource contributes to clean environment.
- Methane is the primary contributor to the formation of ground-level ozone, a hazardous air pollutant and greenhouse gas, exposure to which causes 1 million premature deaths every year worldwide.

- **Economic and Technological benefits:**
- The project is among the few in the region than captures biogas and uses the same for the generation of electricity for captive uses at the project site.
- Cattle dung is transformed into high-quality enriched bio-manure/fertilizer which provides better soil enrichment in the areas surrounding the PoA.
- The revenue from carbon credits will showcase such efforts undertaken to curb CH_4 emissons as being highly profitable and will encourage larger capacity installations and additions across all livestock farms and make the Indian dairy and livestock sector environmentally sustainable.
- Finance is another hurdle for setup of such biogas plants. A biogas plant is a large investment. However, revenue from the sale of carbon credits will force green entrepreneurs to give it a second thought under the UCR Program. India's biogas potential from cattle dung is estimated at 1000 MTA from 300 million cows & buffaloes.

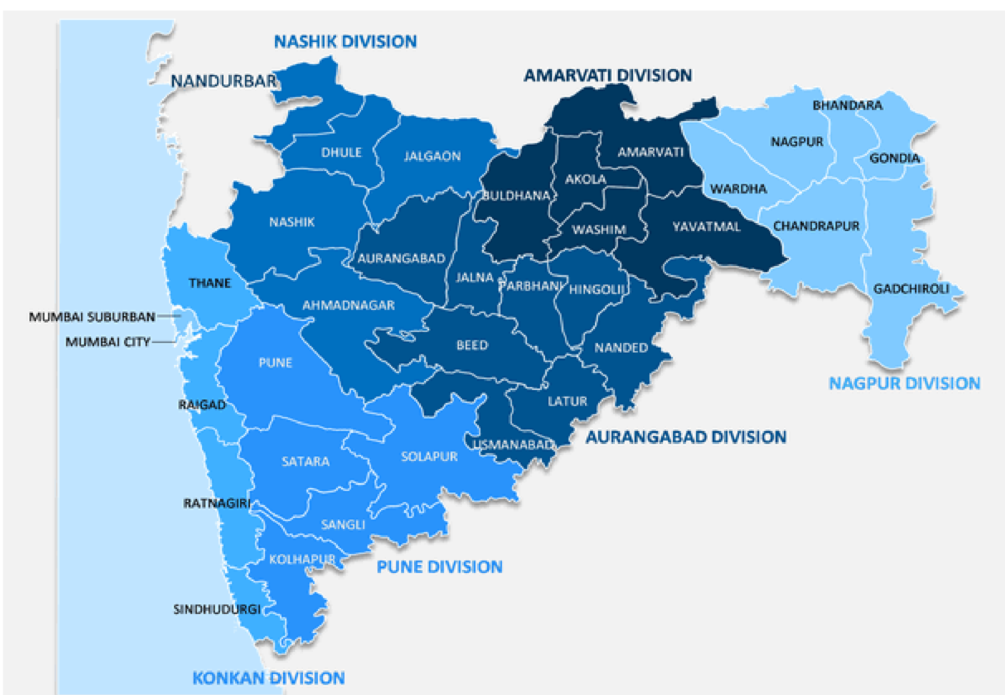
A.3. Location of project activity >>

Country: India

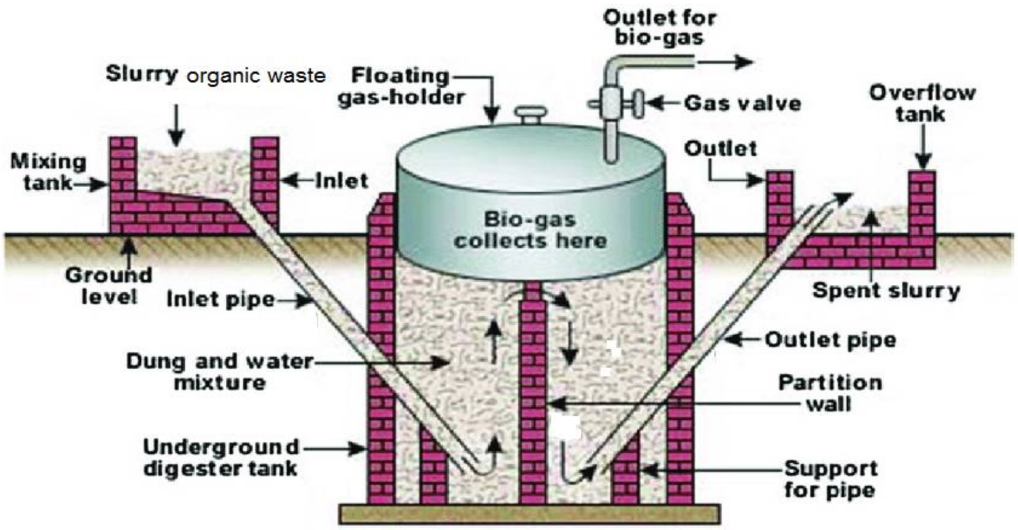
Districts: Marathwada, Nashik, Pune, Raigad and Osmanabad

Taluka: Jalna, Nashik, Pune, Baramati, Osmanabad, Aurangabad, Shirur, Chale, and Talegaon

State: Maharashtra



A.4. Technologies/measures >>



Biogas is a mixture of methane and carbon dioxide. It also has traces of hydrogen sulphide (3%), ammonia, oxygen, hydrogen, water vapour etc., depending upon feed materials and other conditions. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become more active. Thus, the gas produced becomes rich in methane. The optimum utilization depends upon the successful physical installations, which in turn depend upon plant design and its selection. The basic conversion principle is that when a non-ligneous biomass is kept in a closed chamber for a few days, it ferments and produces an inflammable gas. The anaerobic digestion consists of three stages: I Hydrolysis; II Acid formation and III Methane fermentation. The processes are carried out by two sets of bacteria namely acid forming bacteria and methane formers. The acidogenic phase I is the combined hydrolysis and acid formation stages in which the organic wastes are converted mainly into acetate, and phase II is the methanogenic phase in which methane and carbon dioxide are formed. The better the three stages merge with each other, the shorter the digestion process.

The technical specifications of the modified KVIC model bio-digesters are as follows:

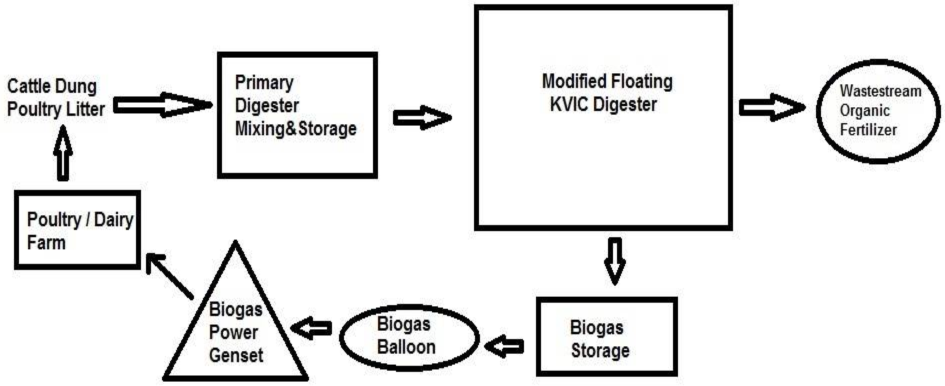
Specification	Value
Total Installed Capacity	4950 m^3
Mixing Proportion	(Water: Waste) 1:1
Number of units (digesters)	13
Feed Material	Cattle Dung
Biogas Power Installed Capacity	0.573 MW_h
Working Days	330
Calorific Value Biogas	20 MJ/m^3
Concentration of methane in the biogas	0.43008kg $CH4/m^3$ Applied an expected fraction of methane in biogas of 0.60 m3CH4/m3 multiplied by the density of methane at normal conditions of 0.7168 kg/m3

The cattle dung from each dairy farm is collected from the cattle sheds within the project boundary and unloaded into the underground primary collection tank fitted with agitator to prepare homogenous slurry with a dry solid content of 20 %. The dry solid content of the homogenous slurry is measured periodically in the laboratory for ensuring the percentage of the dry solid content.

The raw slurry from the underground RCC collection tank is fitted with submersible stirrer to homogenously mix the substrate.

Modified KVIC Floating Methanization Digesters: The PoA has a total of 13 independent biogas digesters between the 50 m^3 and 1000 m^3 in capacity with arrangements of continuous stirring. The high rate digester treats cattle dung under anaerobic condition and converts 50 % of organic carbon to produce Biogas.

The retention time of slurry in the digester is 25 days with an operating temperature of 55˚C. The methanization digesters are fitted with stirrers that ensure dry solid control within the digester to an average value of 15%.



Processing of Treated Slurry: The treated slurry is dewatered and the dry cake is used as high quality organic fertilizer.

Biogas Storage System: The biogas from all the digesters are collected in a gas storage facility and then sent to balloon holding chamber with a cumulative storage capacity of 4950m^3 in this PoA.

Scrubbing System: From the ballons, the raw biogas is sent to scrubbing containers that remove CO_2 and H_2S gases and provide the raw biogas with a methane content of approximately 60%. This purified CH4 is then typically stored in another ballon chamber for further usage.

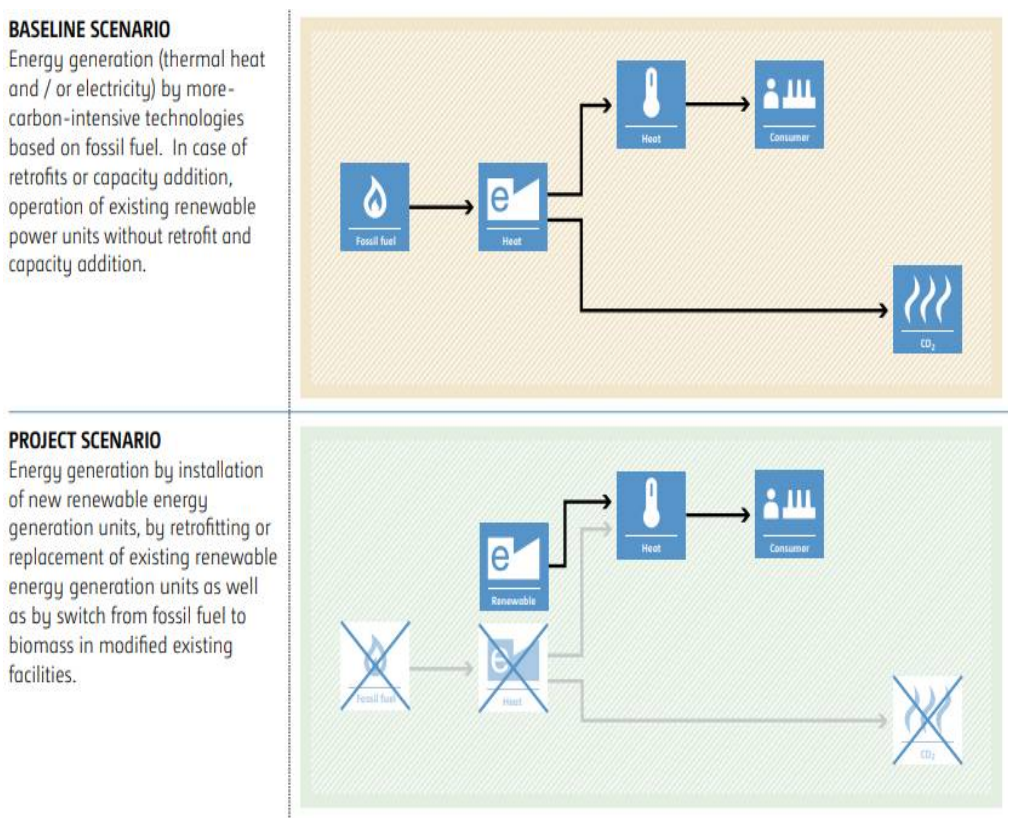
Power Generation: The scrubbed biogas is then sent to biogas generators which is typically a spark ignition inter-cooler engine generator. The PoA genset capacity ranges between 10 kwh to 120 kwh with a total number of 13 generators installed within the PoA. The electrical efficiency is about 38% of each generator.

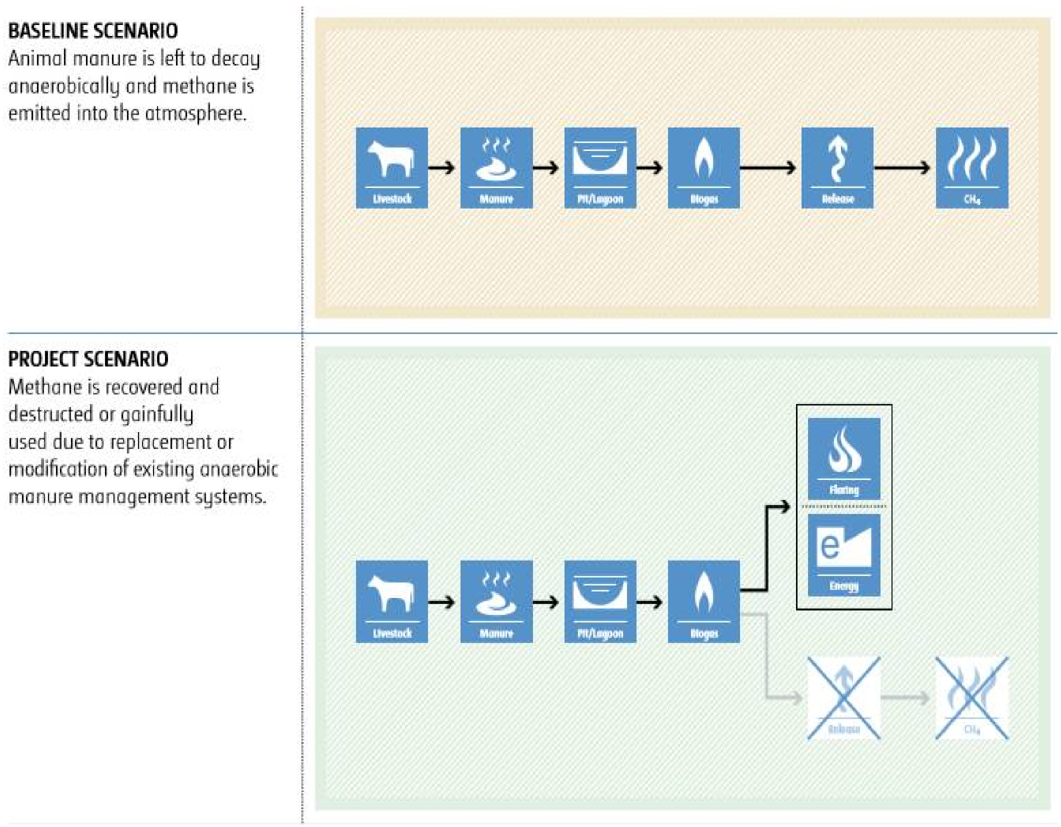
A.5. Parties and project participants >>

Party (Host)	Participants
India	Urja Bio System Pvt. Ltd., Pune, Maharashtra, India

Sr no	Name of client	location	Use of biogas	Capacity m3
1	MGM college	Aurangabad	Power 25kW	**200**
2	Surendra Girme	Pune	Power , 36 KW	**300**
3	Amey Balasaheb Patil	Osmanabad	Power , 36 KW	**300**
4	Modern Dairy	Nashik	Power , 24 KW	**200**
5	Sarda Dairy	Nashik	Power , 120 KW	**1000**
6	Parbhani Agro tech	Jalna	Power , 50 KW	**500**
7	Govind Baug	Baramati	Power , 12 KW	50
8	BAIF	Pune	Power , 10 KW	100
9	Deepak kargal	Shirur	Power , 12 KW	100
10	Sandeep Ghojge	Talegaon , Pune	Power , 24 KW	200
11	Novosera Raut Serum	Pune	Power , 100 KW	1000
12	Aba Sutar	Chale, Pune	Power , 24 KW	200
13	KVK	Baramati	Power 100kw	800

A.6. Baseline Emissions>>





The baseline scenario identified at the PCN stage of the project activity is:

- where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere.

- the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced. Hence the baseline scenario is also electricity imported from a grid in the absence of the project activity.

A.7. Debundling>>

This micro scale project is not a debundled component of a larger project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE - 01 Energy industries (Renewable/Non-renewable sources)
13 Waste handling and disposal

TYPE I - Renewable Energy Projects

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

This methodology comprises renewable energy technologies that supply users i.e. residential, industrial or commercial facilities with thermal energy that displaces fossil fuel use. These units include technologies such as energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.

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

Replacement or modification of existing anaerobic manure management systems in livestock farms, or treatment of manure collected from several farms in a centralized plant to achieve methane recovery and destruction by flaring/combustion or energetic use of the recovered methane.

B.2. Applicability of methodologies and standardized baselines >>

This project activity comprises measures to avoid the emissions of methane to the atmosphere from cattle dung within the project boundary.
No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.
The livestock population in the farm is managed under confined conditions
Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries); Biogas is used for renewable power generation for captive use.
The PoA is biogas power plant and is not a co-generation project.
In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month
Residual waste from the digestion is handled aerobically
The storage time of the manure after removal from the animal barns, including transportation, does not exceed 45 days before being fed into the anaerobic digester
Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO2 equivalent annually from all Type III components of the project activity.
This is a small scale project with total electricity capacity of 0.573 MW which is not greater than small scale thresholds defined by the applied methodology I.C. under Type I – renewable energy project activity, i.e. the total installed electrical energy generation capacity of the project equipment does not not exceed 15 MW.

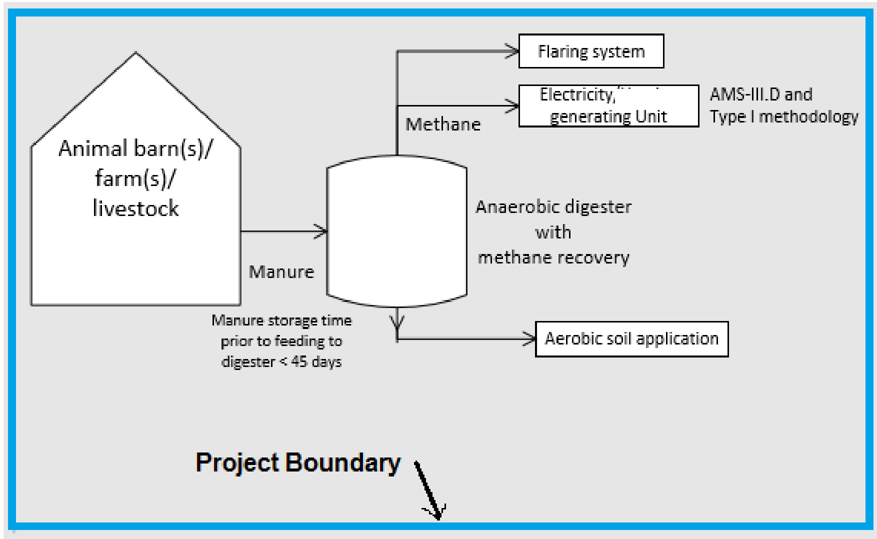
B.3. Applicability of double counting emission reductions >>

Each of the biogas unit is constructed within the project boundary. Each biogas unit has a unique ID, which is visible on the biogas unit and each power generator set has a unique ID and metering system. The Monitoring Report has the details of the end user's name and the location i.e. District, Mandal, village in which it is constructed along with the Unique ID.

B.4. Project boundary, sources and greenhouse gases (GHGs)>>

The project boundary includes the physical, geographical site(s) of:

- (a) The livestock;
- (b) Animal manure management systems (including centralised manure treatment plant where applicable);
- (c) Facilities which recover and use methane for power generation.



	Source	GHG	Included?	Justification/Explanation
Baseline	Methane Emissions from manure decay	CO_2	**Included**	Major source of emission
		CH_4	**Included**	Major source of emission
	Emissions from electricity generated using fossil fuels	N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Co_2 Emissions from on-site electricity use	CO_2	Excluded	Electricity is generated from collected biogas, hence these emissions are not accounted for.
	CH_4 Emissions from flaring of the biogas	CH_4	**Included**	Included as Project Emissions
	CH_4 Emissions associated with anerobic digesters	N_2O	Excluded	Excluded for simplification. This is conservative

The project activity recovers and utilizes biogas for producing electricity and applies AMS IC methodology in addition to using a Type III component of a SSC methodology, hence any incremental emissions occurring due to the implementation of the project activity is neglected.

B.5. Establishment and description of baseline scenario (UCR Protocol) >>

The baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. Baseline emissions (BE_{y1}) are calculated by using the following option: a) Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 approach (please refer to the chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure (Bo).

For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced. Hence the baseline scenario is also electricity is imported from a grid.

The project proponent was not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace fossil fuel derived grid electricity.

Estimated Annual Emission Reductions: $BE_y = BE_{y1} + BE_{grid} – PE_{flare} - PE_{AD,y}$

BE_y = Total Baseline Emissions in a year.

$BE_{grid} = EG_{y,grid} \times EF_{y,grid}$

BE_{grid}	=	Baseline emissions for the grid electricity displaced by the project in year y (t CO2e)
$EG_{y,grid}$	=	Amount of grid electricity displaced by project in year y (MWh)
$EF_{y,grid}$	=	Emission factor of the grid (t CO2e/MWh) = 0.9 (UCR Standard)

$BE_{y1} = GWP_{CH4} \times D_{CH4} \times UF_b \times \Sigma MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j}$

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

BE_{y1}	= Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (VS) content
$N_{LT,y}$	= Average number of animals of type LT in a year
W_{site}	= Avg. Wt. at Site (Taken for Cow) in kg
$W_{default}$	= Avg. Default Wt. of (Cow) as per IPCC for India in kg
nd_y	= Number of days in year y where the treatment was operational
$VS_{default\_cattle/poultry}$	= Volatile solids of livestock LT entering the animal manure management system in year y as per IPCC default for poultry and cattle for India
UF_b	= Model correction factor to account for model uncertainties (0.94) Default
VS_{jLTy}	= Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis) (Cattle= 2.6). As per IPCC guidelines
D_{CH4}	= CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
MCF_j	= Annual methane conversion factor (MCF) for the baseline animal manure management system j (Cattle=5%), solid storage.
$B_{O,LT}$	= Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg dm) in Indian Subcontinent (Cow =0.13). IPCC 2006 - IPCC Default Value taken for Indian Subcontinent

VS = Volatile Solids

The feed digestibility in the range of 50 to 60% has been considered as appropriate for this PoA. The production of volatile solids is very much dependent on the feed digestibility levels. Corresponding to the feed intake levels, the estimated dietary net energy concentration of diet of 5.5 MJ kg (NEma) has been found appropriate considering the default Values for Moderate Quality Forage taken from IPCC 2006, Ch. 10, Vol. 4, Table 10.8 Page 10.23. Based on the above value, at 50 to 60% feed digestibility levels, the Dry Matter Intake comes around 49 kg/day for a 295kg cattle head as per the equation (Equation 10.18a in IPCC 2006 chapter 10, volume 4, Page 10.22) as follows :

DMI = BM0.75 x[{[(0.0119xNEma 2)+0.1938]}/NEma] where:

DMI = Dry Matter Intake;
BM = Live Body Weight = Default Value of 275 Kg (as given in IPCC 2006 table 10.A.6, chapter 10, volume 4, Page 10.77 considered).

NEma = estimated dietary net energy concentration of diet (Default Values for Moderate Quality Forage taken from IPCC 2006, Ch. 10, Vol. 4, Table 10.8 Page 10.23 = 5.5 MJ kg^{-1}

$VS_{Default, Cow}$ is the value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day) = 2.6

GWP_{CH4} = 21 is the default IPCC value of CH_4 applicable to the crediting period (tCO_{2e}/t CH_4)

Project Emissions:

$\mathbf{PE}_{flare,y}$ = Emissions from flaring of the biogas stream in the year y (tCO_{2e})

$\mathbf{PE}_{flare,y} = GWP_{CH4} \times \Sigma TM_{RG,h} \times (1 - \eta_{flare,h}) \times 0.001$

$PE_{AD,y}$ = Project Emissions associated with anerobic digesters in year y (tCO_{2e})

PE $_{leakage}$ = Nil
PE $_{transport}$ = Nil

Emissions from incremental transportation in the year y (t CO2e), and physical leakage is negligible since the dung is generated within the project boundary of all the sites in the PoA.

PE $_{power, y}$ = Nil.

No fossil fuel is used for power generation within the PoA. The electricity generated for captive use. The use of the recovered biogas is within the project boundary and its output is monitored in order to ensure that the recovered biogas is actually destroyed. Project emissions on account of storage of manure before being fed into the anaerobic digester is not accounted since the storage time of the manure after removal from the animal barns, including transportation, does not exceed 24 hours before being fed into the anaerobic digester.

Estimated total baseline emission reductions (*BE*) = 200356 CoUs (200356 tCO_{2eq})

Year	Emission Reductions (tCO2eq)
2014	5583
2015	6268
2016	19134
2017	25458
2018	27420
2019	27412
2020	40735
2021	48346
Total	200356

B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits.

B.7. Changes to start date of crediting period >>

Start Date of the PoA: 15/06/2009

There is no change in the start date of crediting period.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

There are no permanent changes from registered PCN monitoring plan and applied methodology

B.9. Monitoring period number and duration>>

First Issuance Period: 7 years, 10 months – **1/01/2014 to 31/10/2021**

B.8. Monitoring plan>>

Data/Parameter	N_L
Data unit	Number
Description	Number of head of cattle
Source of data Value(s) applied	Head count of cattle whose waste is used for generating biogas
Measurement methods and procedures	Based on back-calculation of poultry litter requirement of the plant. Poultry average generation data - Cattle average generation data (15kg/head/day)
Monitoring frequency	As and when commissioned and fixed and recorded in the monitoring report
Purpose of data	To estimate baseline emissions

Data / Parameter:	Q_{waste}
Data unit:	tons
Description:	Quantity of solid waste or residual waste handled by each digester based on capacity monthly.

Source of data:	Measured
Measurement procedures (if any):	On-site data sheets recorded monthly using weigh bridge
Monitoring frequency:	Monthly-
QA/QC procedures:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Any comment:	-

Data / Parameter:	**N_y**
Data unit:	Number of operational days in a year
Description:	Measured
Source of data:	-
Measurement procedures (if any):	Records kept in the log book.
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	MCF
Data unit:	%
Description:	Annual methane conversion factor. The MCF indicates the extent to which, under certain conditions, the degradable substances will actually be converted into methane.
Source of data:	-IPCC Guidelines
Measurement procedures (if any):	AMS-III.D provides three options for obtaining the manure production and methane production potential. These include: Data from nationally published sources; Estimated from actual feed intake levels, via the enhanced characterisation method (tier 2) Default values provided in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. The project proponent has used the IPCC default values to estimate the baseline emissions. It also ensures that the baseline emissions are calculated in a conservative manner.
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	-
Any comment:	-Baseline emissions are calculated in a conservative manner.

Data / Parameter:	$EG_{grid,y}$
Data unit:	MWh
Description:	Quantity of electricity generated
Source of data	Plant records
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant methodologies.
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedure	-
Any comment:	The parameter need to be monitored for project activities which displaces grid electricity

Data / Parameter:	$EF_{grid,y}$
Data unit:	t CO_2e/MWh
Description:	CO_2 emission factor for the grid electricity in year *y*
Source of data	-As described in UCR Standard
Measurement procedures (if any):	0.9
Monitoring frequency:	NA
QA/QC procedure	-
Any comment:	The parameter need to be monitored for project activities which

	displaces grid electricity

Data / Parameter:	**VS**
Data unit:	kg/head/day
Description:	Volatile Solids production per head
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’ -
Measurement procedures (if any):	Cattle= 2.6
Monitoring frequency:	NA
QA/QC procedure	The project proponent has used a combination of the field values and the IPCC default values to estimate the baseline emissions and an assessment on its suitability has been provided. It also ensures that the baseline emissions are calculated in a conservative manner
Any comment:	Baseline Emissions