PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Small Scale Cattle Biogas to Power Projects in Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, India

Version 1.0
Date 02/11/2021
First CoU Issuance Period: 3 years, 10 months
Date: 01/01/2018 to 31/10/2021

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

BASIC INFORMATION	
Title of the project activity	Small Scale Cattle Biogas to Power Projects in Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, India
Scale of the project activity	Small Scale
Completion date of the PCN	02/11/21
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	143945 CoUs (143945 tCO_{2eq})

SECTION A. Description of project activity

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

The project **Small Scale Cattle Biogas to Power Projects in Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, India** is located across 9 Villages in the State of Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, Country: India.

The details of the registered project are as follows:

Purpose of the project activity:

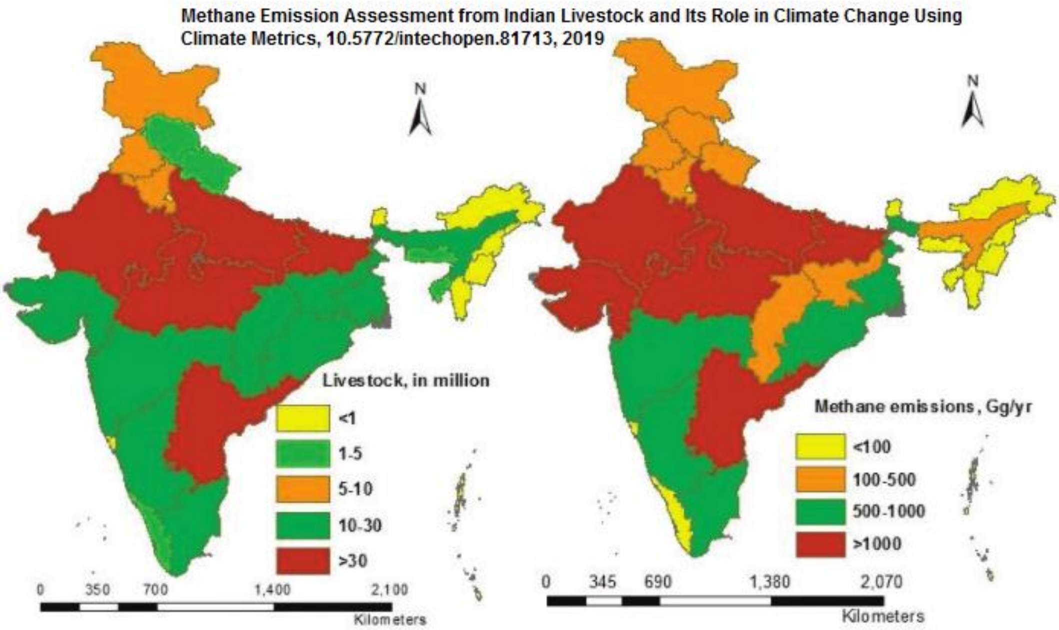
The **Small Scale Cattle Biogas to Power Projects in Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, India** is located across the following Districts: Hisar, Dhanera, Palanpur, Kheda, Seekar, Hoogly, Tumkur, Trivendrum and Raipur, State: Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana, Country: India.

The small scale project activities involve the installation of 9 independent biogas digesters between the 200 m^3 and 2000 m^3 capacity range, for serving the captive electricity needs at the location of the project activities. Fresh cattle dung is fed into the anaerobic digesters.

Name	Location Village	State	Capacity
CIRB , Sirsa Road	Hisar	Haryana	200 m3
Navsagar Dairy	Dhanera	Gujarat	300 m3
Barkat bhai prasla	Palanpur	Gujarat	2000 m3
Arco Steel	Kheda	Gujarat	400m3
Olitia Foods	Seekar	Rajasthan	200 m3
SRC Farms	Hooghly	West Bengal	400 m3
Sunvik Farms	Tumkur	Karnataka	1000 m3
Murliya Dairy	Trivendrum	Kerala	600m3
Sarda dairy	Raipur	Chhatisgarh	1200 m3

The project activities involves 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 project activity, that requires the collection and destruction of methane from livestock manure. In the absence of the project activities, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. The project activities recover and utilize biogas for producing electricity for captive use and hence displaces electricity from the grid using fossil fuels. The projet activities hence avoid CH_4 and CO_2 emissions and is beneficial to the environment and community.

Worldwide, agricultural operations are becoming prog ... mies of production and scale. The pressure to become ... onal similarities between farms of a “type,” as inputs, out ... have become similar around the world. This is especially ... dairy cows, etc.) which can create profound environme ... gas emissions, odour, and water/land contamination (incl ... on), that result from storing (and disposing of) animal wast



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 owners in the project activities can be classified as medium to large-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).

Type of waste	Digester Capacity Installed (total)
Cattle dung based	6300 m^3

Type of waste	Estimated TPD treated in the digesters
Cattle dung	126 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.

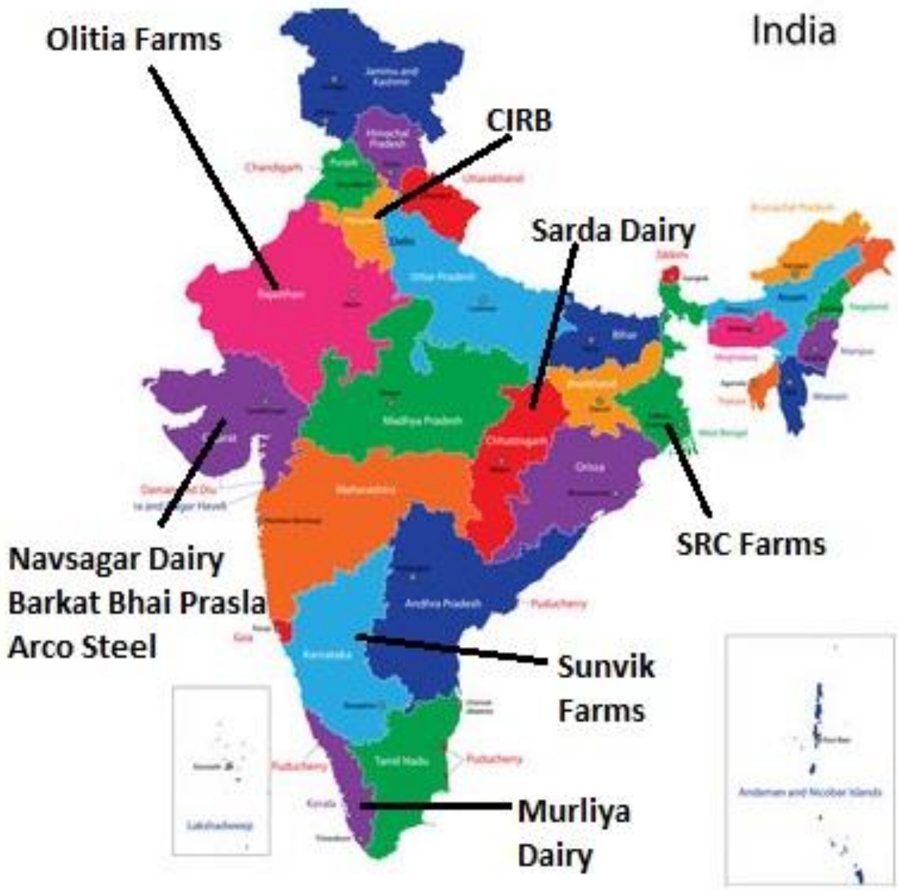
- The project provides security of energy supply since it generates biogas based electricity
- It leads to better waste management thus keeping the surroundings clean and reduce some of the disease causing pathogens
- Biogas allowed farms in the project activities to become self-sufficient in power and 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.
- 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.

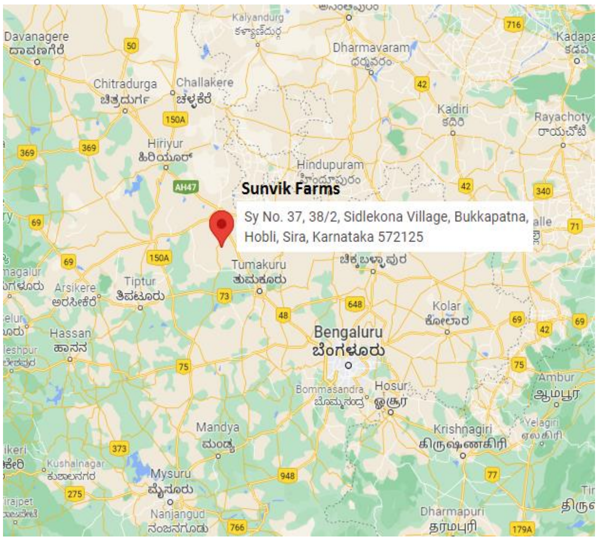
- **Economic and Technological benefits:**
- The project is among the few in the region than captures biogas and uses the same for the generation of electricity for captive uses at the project site.
- Cattle dung is transformed into high-quality enriched bio-manure/fertilizer which provides better soil enrichment in the areas surrounding the project activities.
- 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 >>

Districts: Hisar, Dhanera, Palanpur, Kheda, Seekar, Hoogly, Tumkur, Trivendrum and Raipur,
State: Gujarat, Rajasthan, Karnataka, West Bengal, Chhattisgarh, Kerala and Haryana,
Country: India.


India
Olitia Farms
CIRB
Sarda Dairy
SRC Farms
Navsagar Dairy
Barkat Bhai Prasla
Arco Steel
Sunvik
Farms
Murliya
Dairy


Amlaan A2 Gir Cow Farm By Olitia
Amlaan A2 Gir Cow Farm By Olitia
Temporarily closed
PUNJAB
UTTARAKHAND
Nepal
UTTAR PRADESH
Lucknow
Jaipur
RAJASTHAN
Kanpur
Patna
MADHYA PRADESH
India
Indore
Ahmedabad
JHARKHAND
CHHATTISGARH
Nagpur
Surat
Nashik


Sunvik Farms
Sy No. 37, 38/2, Sidlekona Village, Bukkapatna, Hobli, Sira, Karnataka 572125
Davanagere
Chitradurga
Challakere
Dharmavaram
Hiriyur
Hindupuram
Tumakuru
Tiptur
Hassan
Bengaluru
Kolar
Hosur
Mandya
Mysuru
Krishnagiri
Dharmapuri


Central Institute For Research On Buffaloes
Sirsa Rd, Sector 14, Hisar, Haryana 125001
Lahore
HIMACHAL PRADESH
Pakistan
HARYANA
New Delhi
Nepal
UTTAR PRADESH
Jaipur
Lucknow
RAJASTHAN
Patna
GUJARAT
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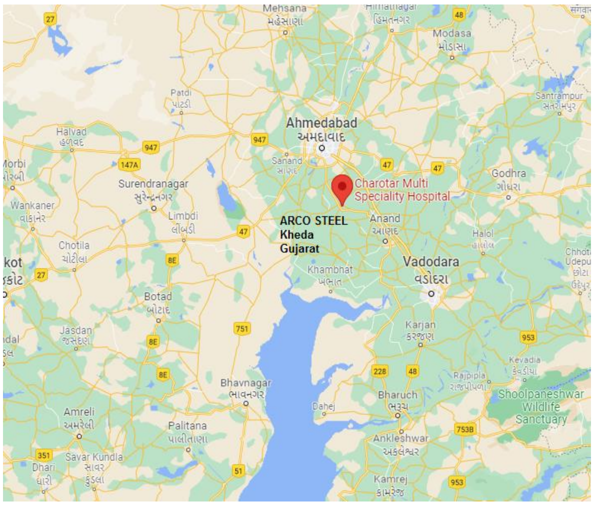
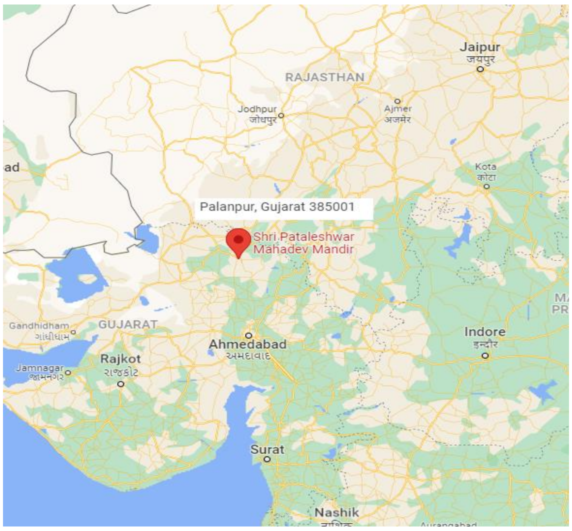
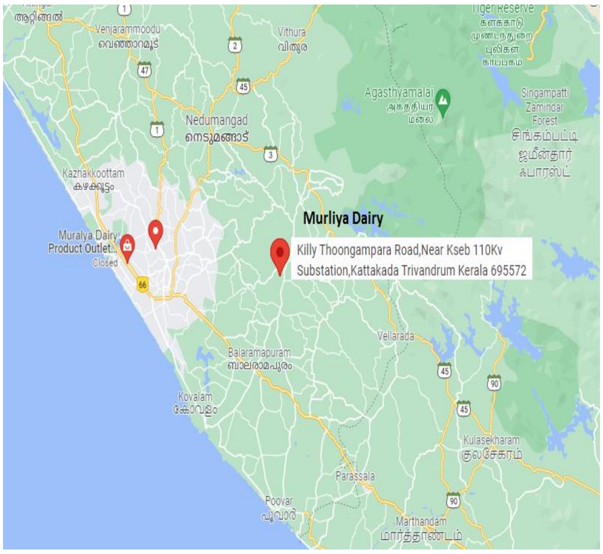
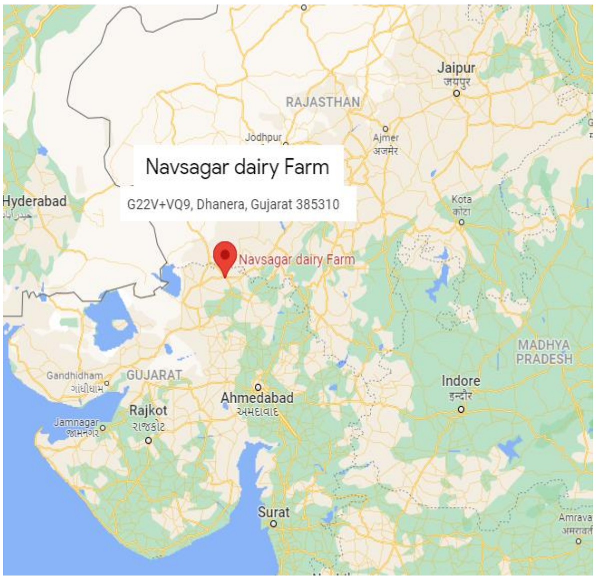
Indore
MADHYA PRADESH
India
CHHATTISGARH


Mehsana
Modasa
Ahmedabad
Charotar Multi Speciality Hospital
ARCO STEEL
Kheda
Gujarat
Surendranagar
Anand
Vadodara
Godhra
Botad
Bhavnagar
Bharuch
Amreli
Palitana
Ankleshwar
Shoolpaneshwar Wildlife Sanctuary


Palanpur, Gujarat 385001
Shri Pataleshwar Mahadev Mandir
Jaipur
RAJASTHAN
Jodhpur
Ajmer
Kota
GUJARAT
Ahmedabad
Rajkot
Indore
Surat
Nashik

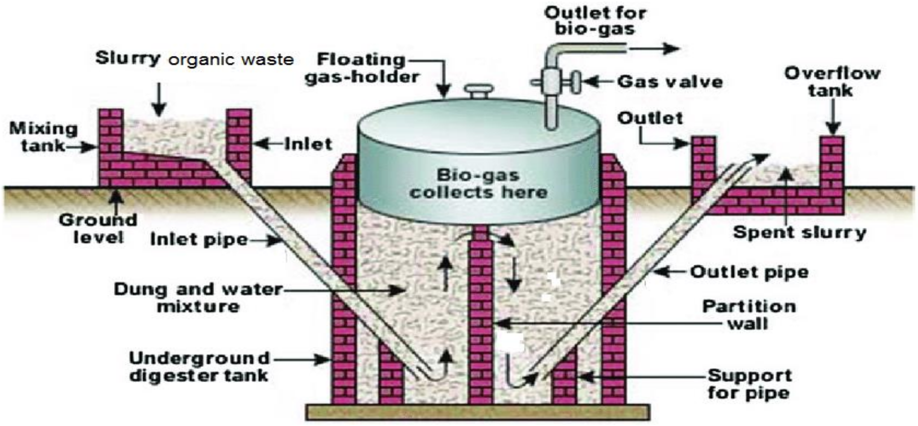

18/1b, Hindustan Rd, Ballygunge, Kolkata, West Bengal 700029
SRC FARMS PVT LTD
SRC FARMS PVT LTD
Pawnan Road
Patna
BIHAR
MEGHALAYA
JHARKHAND
Dhaka
WEST BENGAL
Ranchi
Khulna
Rourkela
ODISHA
Cuttack
Bhubaneswar
Puri





A.4. Technologies/measures >>

Commissioning Date: 23/03/2018



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	6300 m^3
Mixing Proportion	(Water: Waste) 1:1

Number of units (digesters)	9
Feed Material	Cattle Dung
Biogas Power Installed Capacity	0.793 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

Year	2018	2019	2020	2021
Capacity Installed m3	200	2900	4500	6300

Numbers Annually Total Within Project Sites	2018	2019	2020	2021
Cattle	267	3867	6000	8400

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 project activities have a total of 9 independent biogas digesters between the 200 m^3 and 2000 m^3 capacity range 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%.

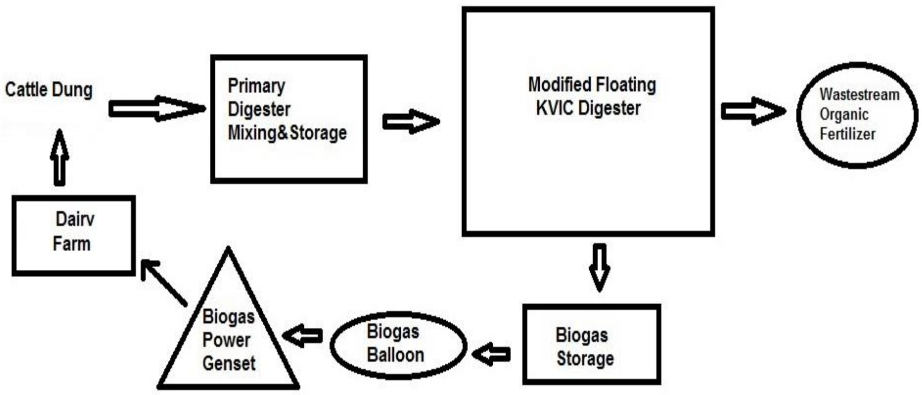
Processing of Treated Slurry: The treated slurry is dewatered and the dry cake is used as high quality organic fertilizer.

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 6300 m^3 in this group of project activities.

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 genset capacities in the project sites ranges between 24 kwh to 250 kwh with a total number of 9 generators installed within the project activities. The electrical efficiency is about 38% of each generator.

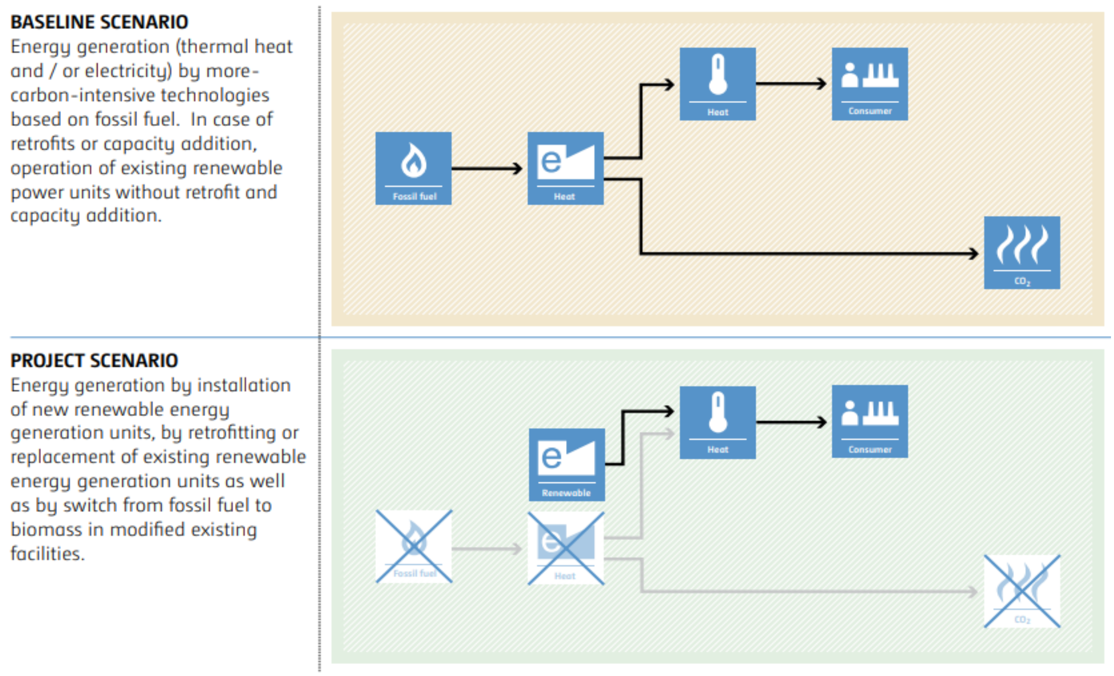
Name	Power Capacity Kwh
CIRB	24
Navsagar Dairy	50
Barkat bhai prasla	250
Arco Steel	50
Olitia Foods	24
SRC Farms	50
Sunvik Farms	120
Murliya Dairy	75
Sarda dairy	150
Total	793

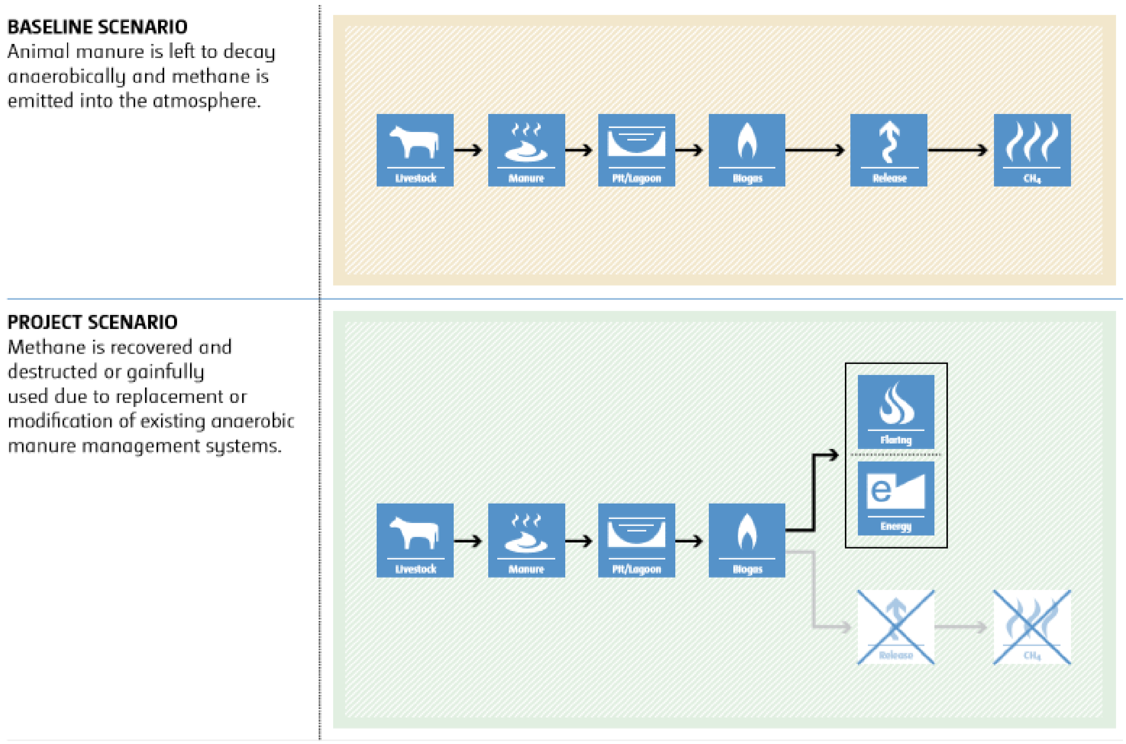


A.5. Parties and project participants >>

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

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 registered carbon 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 project activity 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 0.793 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.

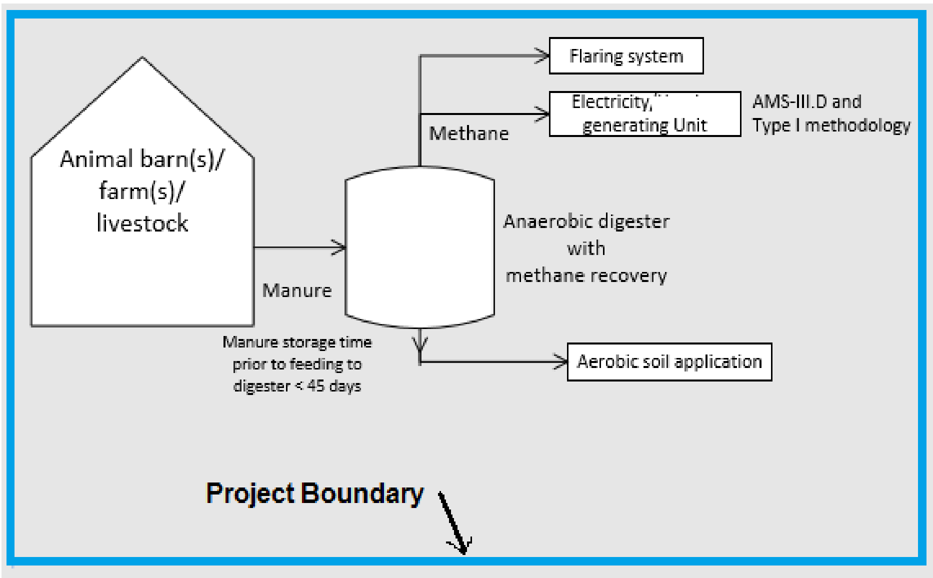
B.3. Applicability of double counting emission reductions >>

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
$VS_{default\_cattle/}$	= Volatile solids of livestock LT entering the animal manure management system in year y as per IPCC default for 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 project activity. 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:
$PE_{flare,y}$ = Emissions from flaring of the biogas stream in the year y (tCO_{2e})

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

$PE_{AD,y}$ = 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 project activity.

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

No fossil fuel is used for power generation within the project activity. 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 during the crediting period

(*BE*) = 143945 CoUs (143945 tCO_{2eq})

Year	Emission Reductions
2018	2030
2019	29918
2020	46886
2021	65111
Total	143945

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 >>

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 CoU Issuance Period: 3 years, 10 months
Date: 01/01/2018 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 dung requirement of the plant. Cattle dung average generation data (i.e. 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