Monitoring Report (Ver2.0)

CARBON OFFSET UNIT (CoU) PROJECT


Title: Lamdeng Waste to Energy Project, Manipur

UCR ID: 012

Date of MR: 18/01/2023

1st Issuance Period: 5 years, 11 months

1st Monitoring Period: 01/01/2017 to 30/11/2022

1st Crediting Period: 01/01/2017 to 30/11/2022

Monitoring Report (MR) ver 2.0
CARBON OFFSET UNIT (CoU) PROJECT

Monitoring Report

Title of the project activity	**Lamdeng Waste to Energy Project, Manipur**
UCR Project Registration Number	012
Version	2
Completion date of the MR	18/01/2023
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 1 Duration of this monitoring Period: (first and last days included (**01/01/2017 to 30/11/2022**)
Project participants	Project Owner: IEC-TSL Ingenious Energy LLP UCR Aggregator: M/S Gram Vikas Trust
Host Party	India
Applied methodologies and standardized baselines	Small-scale Methodology AMS.I.D. Grid connected renewable electricity generation UCR Protocol Standard Baseline AMS-III.E Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment
Sectoral scopes	SECTORAL SCOPE - 01 Energy industries (Renewable/NonRenewable Sources) 13 Waste handling and disposal
Estimated amount of GHG emission reductions for this monitoring period	2017: 2337 CoUs
	2018: 5488 CoUs
	2019: 6426 CoUs
	2020: 6790 CoUs
	2021: 9941 CoUs
	2022:13889 CoUs
Total:	**44871 CoUs (44871 tCO_{2eq})**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity >>

a) Purpose of the project activity and the measures taken for GHG emission reductions >>

The project **Lamdeng Waste to Energy Project, Manipur** is located at Village: Lamdeng, District: Imphal West, State: Manipur, India.

The details of the registered project are as follows:

Purpose of the project activity:
The **Lamdeng Waste to Energy Project, Manipur** is located at Village: Lamdeng, District: Imphal West, State: Manipur, India. The waste processing facility (project activity) treats 120 tonnes of Municipal Solid Waste (MSW) waste per day. In the absence of the project activity, the MSW from Imphal would be dumped in Porompat and Langol open landfill sites.

Construction of the waste processing facility at Lamdeng was completed in November 2014 and operated for trial period for three months (which was in February 2015) and the plant was non-functional after this trial period of three months in 2015. Afterwards, the overall handling and operationalisation of the facility was entrusted to the Planning and Development Authority of Manipur. Further, the possession of the facilities for operation, maintenance and upgradation of the plant was handed over to the project proponent (PP) IEC TSL Private Limited, in **December 2016** in PPP mode by executing a tripartite concession agreement between the parties. The actual operational start date is December 2016 for this project activity.

The project activity avoids the emission of methane from Municipal Solid Waste (MSW) and supplies renewable electricity to the grid through utilization of this MSW fuel which would otherwise have been left to decay anaerobically. Hence the project activity avoids CH_4 and CO_2 emissions and is beneficial to the environment and community. This project activity is included in the UCR Positive List of Project Types with Environmental Additionality.

The project activity involves the processing of Municipal Solid Waste (MSW) into Residue Derived Fuel (RDF). The RDF is used to generate electricity (600 KWh) which is being supplied to the grid that is maintained by the Manipur State Power Company Ltd. (MSPCL), which acts as a deemed transmission licensee for the State of Manipur to undertake the function of transmission of electricity and also discharge all functions of the State Transmission Utility (STU). Between 2017 and April 2021, the MSW was treated by mechanical treatment to produce refuse-derived fuel (RDF)/stabilized biomass (SB). This RDF was transported outside the project boundary and supplied as renewable fuel to replace fossil fuel at various industries, however, no carbon credits are being claimed for this activity outside the project boundary. From April 2021 onwards, the RDF is used for generating renewable power and supplied to the local grid.

There is no negative environmental and social impact for this project activity. By avoidance of methane and utilizing MSW for generation of electricity, the project results in reductions of greenhouse gas emissions that are real, measurable and give long-term benefits to the mitigation of climate change.

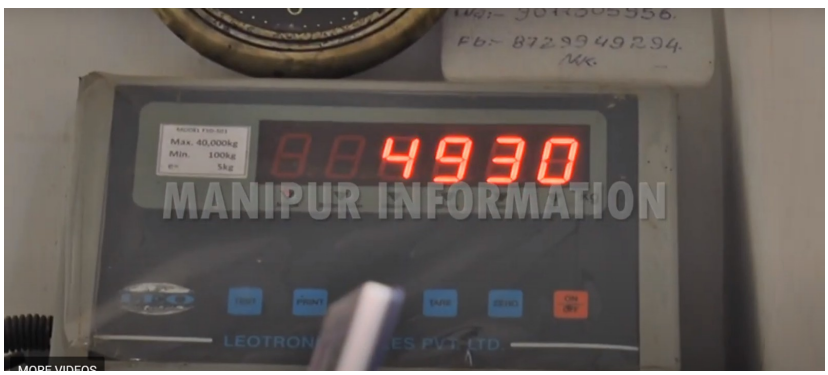
b) Brief description of the installed technology and equipment>>

The project activity processes the MSW and generates RDF which is combusted as the main fuel in the specifically designed gasifier to produce syngas. All the syngas produced, is combusted and not released unburned to the atmosphere. Measures to avoid physical leakage of the syngas between the gasification and combustion sites is already adopted. The syngas passes through the attached generator set to generate power and is connected to the local grid for direct electricity export.

Waste-to-energy plants based on gasification are high-efficiency power plants that utilize municipal solid waste as their fuel rather than conventional sources of energy like coal, oil or natural gas. Such plants recover the thermal energy contained in the garbage in highly efficient boilers that generate steam that can then be used on-site to drive turbines for electricity production.

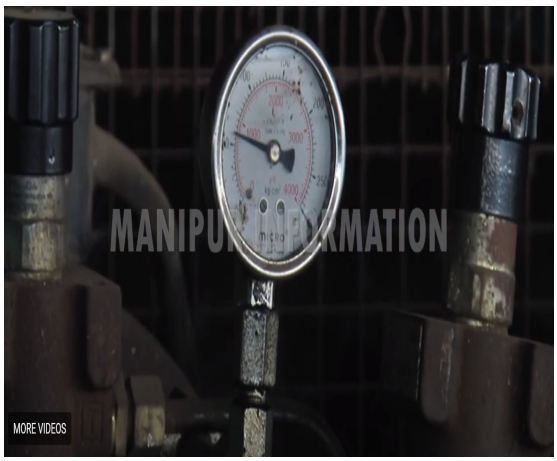
Waste stream	%Waste composition (wet basis)
Waste Processed (TPY) Total Capacity	43800
Wood and Wood Products	3.51
Pulp, paper and cardboard	10.92
Food, Food waste, beverages and tobacco	42.18
Garden yard and park waste	30.2
Inert waste	9.93

Electronic Truck Weigh Bridge (Incoming MSW)



Electronic Weigh Bridge (Incoming MSW)

Unloading Process (MSW)



c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)>>

Date of UCR Project Authorization: _October 2021___
Start Date of Crediting Period: 01/01/2017
Commissioning dates of gasifier: 05/10/2017
Power Supply to Grid start date: 01/04/2021
Continued operations: 01/01/2017 onwards
Initial construction: November 2014
Trial Operations Period: November 2014-February 2015
Non Functional Period: February 2015-December 2016
PP operating facility since: December 2016

d) Total GHG emission reductions achieved or net anthropogenic GHG removals by sinks achieved in this monitoring period>>

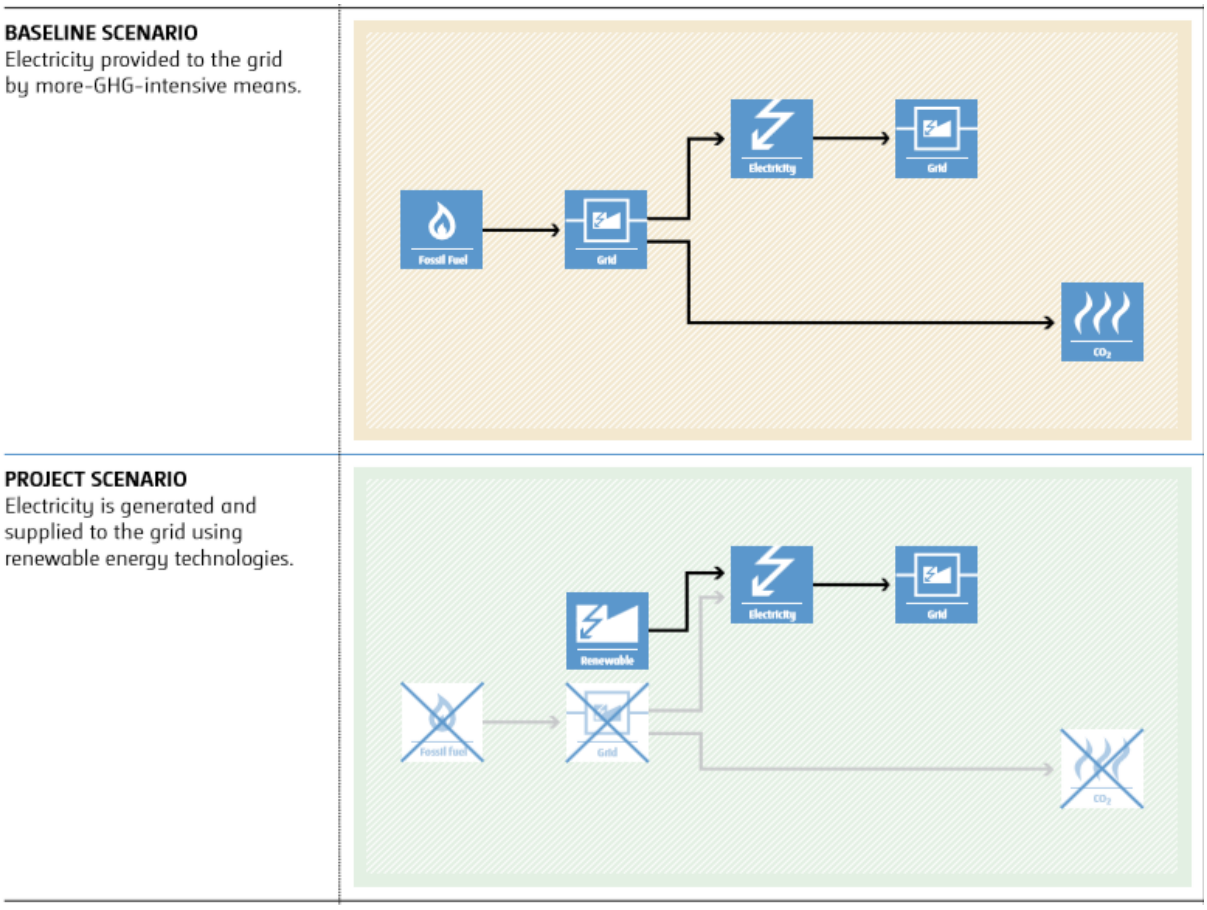
The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of this Monitoring Period	01/01/2017
Carbon credits claimed up to	30/11/2022
Total ERs generated (tCO_{2eq})	44871 tCO_{2eq}
Leakage	907 tCO_{2eq}

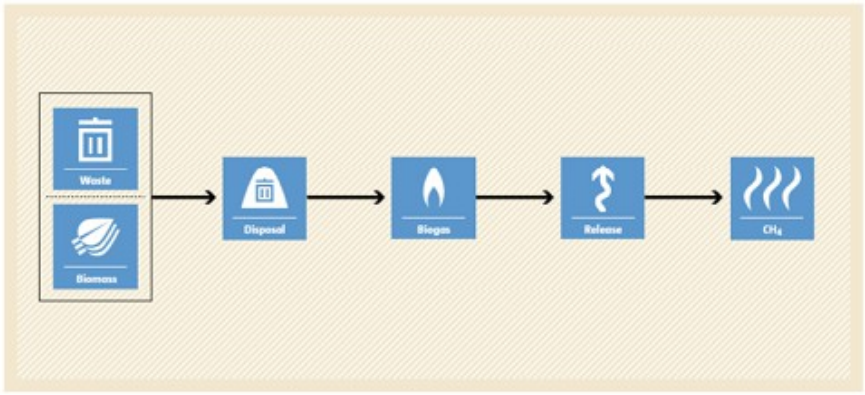
The baseline scenario identified is:

- the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass and other organic matter.

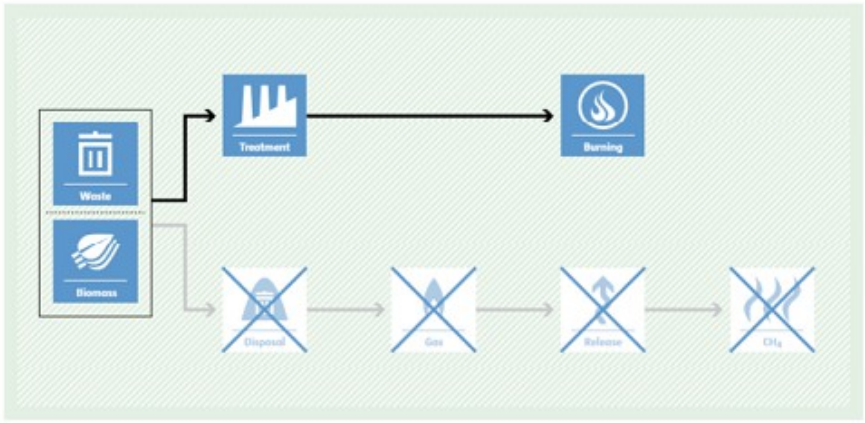
- the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced. Hence the baseline scenario is also electricity imported from a grid in the absence of the project activity.



BASELINE SCENARIO
Organic waste is left to decay and methane is emitted into the atmosphere.



PROJECT SCENARIO
Methane emissions will be avoided through controlled combustion, gasification or mechanical/thermal treatment of the wastes. In case of energetic use of organic waste, displacement of more-GHG-intensive energy generation.



Leakage: Th energy generating equipment was not transferred from another activity or the existing equipment was not transferred to another activity. Leakage Emission has been considered from trucks transporting RDF to processing plants between the monitoring period 01/01/2017-31/10/2022.

A.2. Location of project activity>>

Country: India.
District: Imphal West
Village: Lamdeng
State: Manipur
Code: 795001
Latitude: 24° 50' 25.224" N
Longitude: 93° 53' 23.424" E

A.3. Parties and project participants >>

Party (Host)	Participants
India	Project Owner: IEC-TSL Ingenious Energy LLP, A-103, Sagun Plaza, Vastrapur, Gujarat, Ahmedabad – 380015 UCR Aggregator: M/S Gram Vikas Trust , Gujarat, UCR Seller #741215693 Email:gvtbiogas@gmail.com

A.4. 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.D. Grid connected renewable electricity generation***

This category comprises renewable energy generation units, such as renewable biomass, that supply electricity to and displace electricity from an electricity distribution system that is supplied by at least one fossil fuel fired generating unit.

AMS-III.E . Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment

Decay of the wastes that would have been let to decay or are already deposited in a waste disposal site is prevented through gasification to produce syngas/producer gas; or mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB).

A.5. Crediting period of project activity >>

Type: Renewable
State date: 01/01/2017
End Date: 30/11/2022
Length of the crediting Period corresponding to this monitoring period: **5** years, 11 months

A.6. Contact information of responsible persons/entities >>

PCN, MR and other documentation by
UCR Aggregator: M/S Gram Vikas Trust , Gujarat,
UCR Seller #741215693
Email:gvtbiogas@gmail.com

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity >>

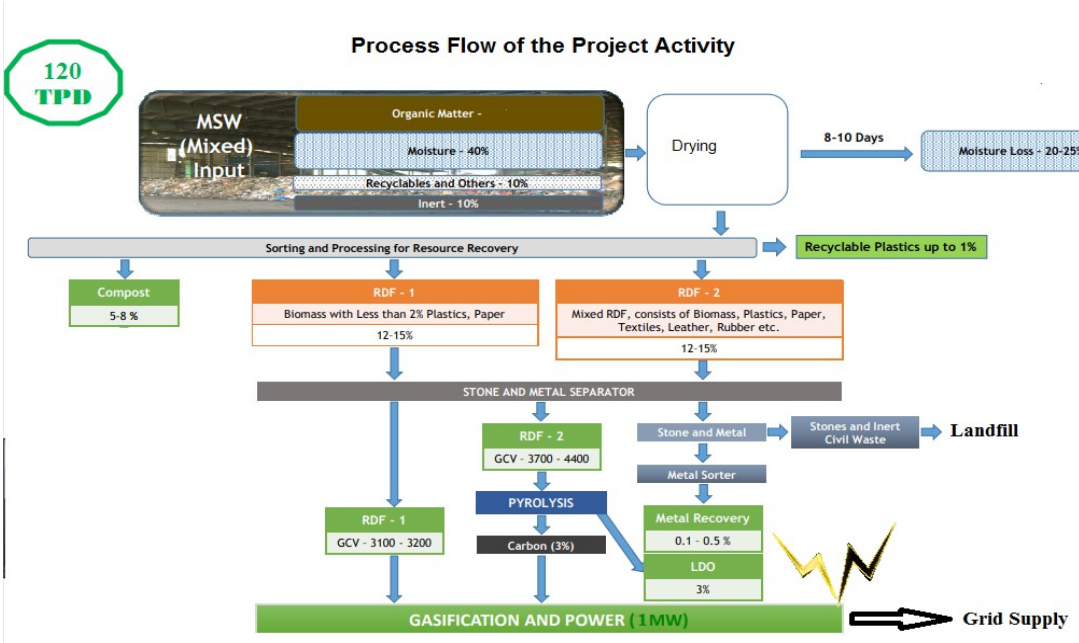
a) Provide information on the implementation status of the project activity during this monitoring period in accordance with UCR PCN>>

Description	Date/Value
Input of MSW	65 TPD (average)
Pretreatment	Enzyme culture
Compost recovered	5TPD (average)
RDF recovered	32 TPD(average)
RDF briquettes manufactured	30TPD (average)
RDF usage	Syngas production and power supply to grid

Solid Waste processed	
Years	**TPY**
2017	20978
2018	27276
2019	8656
2020	6284
2021	684
2022 November	27385

Year	Mwh (supplied to GRID)
2021	3859.2
2022	4910.4

b) For the description of the installed technology(ies), technical process and equipment, include diagrams, where appropriate>>



Incoming MSW from the city using trucks is unloaded on tipping floor. A trammel is placed to screen out stones, accompanying silt as it induces a gyratory movement for the MSW as it tumbles and cascades down the trammel. It involves manual and mechanical sorting further to remove plastics, rubber and leather and large metal objects. The speed of the belt carrying the MSW is variable to permit the same with ease. Incoming MSW from the city using trucks is unloaded on tipping floor.

Before shredding, the incoming MSW is inspected on the horizontal conveyer and odd objects like big inert pieces, wooden pieces, long iron pieces etc. are hand picked and removed. Residue generated prior to primary shredding of MSW is mostly inert material as well as segregated material like rubber, large debris emanating from construction and large biomass objects.

Rubber is recycled while other inert matter is discarded to dump yard. After inspection, it is pushed on the slat conveyor for primary shredding. In primary shredding, MSW is delumped in to small sizes to enable easy drying and separation. Delumped MSW is dried to reduce the moisture content in the drying yard/shed.

The project activity processes the MSW and generates RDF which is combusted as the main fuel in the specifically designed gasifier to produce syngas. All the syngas produced, which may contain non-CO2 GHG, is combusted and not released unburned to the atmosphere. Measures to avoid physical leakage of the syngas between the gasification and combustion sites is already adopted. The syngas passes through the generator set to generate power and is connected to the local grid for direct electricity export.

The project activity consists of one line for MSW Sorting & Processing from 60 TPD capacities, in 8-10 hours of operations. The Treated MSW is conveyed from the windrow section after 10-14 days to the processing section. The treated & dried MSW is subjected to ‘Size Segregation’ & ‘Mass Segregation’.

The following resources are recovered from the MSW during processing based on the size:

- 1. 0-4 mm : Compost, which is sold for usage in Agriculture
- 2. 4-35 mm : Biomass, which is converted to Biomass Briquette
- 3. >35 mm : RDF, partially fed to the inhouse pyrolysis plant for oil recovery & further fuel

preparation in the briquetting machine.

- 4. Recyclables: Partial metal & plastics are recovered
- 5. Inert : Disposed to the local landfill area.

Gas Engine

TECHNICAL SPECIFICATION OF SYNGAS GEN-SET

Genset model	600GFZ1-PwJ-TEM2
Engine model	12V190ZLDK
Alternator model	1FC6
Control system model	TEM2-600
Rated power (KW)	600
Rated current (A)	984
Rated voltage (V)	440
Rated power factor COSΦ	0.8（lagging）
Frequency (Hz)	50
Starting method	24V DC motor
Voltage regulation	Automatic
Exciting method	Brushless
Connecting Method between engine and generator	Flexible coupling
Phase and wiring	Three-phase, four-wire system or Three-phase,
Weight (kg)	10750

B.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:**
- The project contributes in improving the environmental condition in the region of by hygienic treatment of agricultural waste resulting in improvement of health standard in the city.
- The project provides employment opportunity to the local rag pickers who can collect the recyclables from the plant and ensure that only organic waste is treated.
- The project would provide both direct and indirect employment opportunity to the people of the region.
- Reduces outdoor air pollution, thus eliminating health hazards for traders 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. Revenue from carbon credits will change the present situation of MSW management in Imphal which is still at its natal stage and will help improve in areas of technological up gradation, policies, public-private partnerships, public participation and behavioral perspectives of the locals.

- **Environmental benefits:**
- Curbs methane emission as well as any leachate that would otherwise have been generated from the current practice of unscientific waste disposal.
- The land requirement used for a disposal site is removed as also is the area for dumping of equivalent amount of waste. This indirectly enables region towards a better way of land utilisation, like construction of housing, hospital etc.
- Further, by generating electricity through utilising the biogas, the project helps in replacing fossil fuel intensive power generation from the local grid.
- Avoids local environmental air pollution through better waste management
- Leads to soil improvement by providing high quality manure to farmers
- Reduces outdoor air pollution, and increases use of manure rather than chemical fertilizers.
- Using biogas as an energy resource contributes to clean environment.
- Agricultural waste is transformed into high-quality enriched bio-manure/fertilizer.
- Hygienic conditions are improved through reduction of pathogens by utilizing the organic wastes in the bio-digesters.
- Bio manure is a source of organic matter that stimulates biological activity

- **Economic and Technological benefits:**
- The project has a wastewater recycling facility that is powered by the biogas and reuses the water in the digester, hence conserving water.
- Provides employment to local communities through construction and maintenance of biogas units. The project is among the few the region than captures biogas and uses the same for the generation of electricity for captive uses at the project site.
- Agricultural waste is transformed into high-quality enriched bio-manure/fertilizer which is supplied at a lower cost than would normally be available at the retail marketplace, thus providing better soil enrichment for farmers and their crops. The revenue from carbon credits will showcase such efforts undertaken to make the agricultural markets environmentally sustainable by making them responsive toward the recycling of waste and maintaining the energy of ecosystem of market. The gasifier is a tar less process.

B.3. Baseline Emissions>>

The project has applied two SSC methodologies AMS ID and AMS III E. for generating and supplying electricity to grid and avoidance of methane through utilization of MSW. The baseline of project activity is that the project proponent would have left the MSW for decay and would not have thought of power generation and supply to grid.

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

- the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass and other organic matter.

- 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.

The emission reductions have been determined in accordance with the methodology described and there is no project emission related to usage of fossil fuel in power plant within the boundary. The emission reductions are calculated as per methodology. Project emissions associated with the transport of RDF offsite, prior to gasification of RDF and usage for power generation from April 2021 onwards, has been accounted for in the emission reduction calculations.

B.4. Debundling>>

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

SECTION C Application of methodologies and standardized baselines

C.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.D. Grid connected renewable electricity generation***

This category comprises renewable energy generation units, such as renewable biomass, that supply electricity to and displace electricity from an electricity distribution system that is supplied by at least one fossil fuel fired generating unit.

AMS-III.E . Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment

Decay of the wastes that would have been let to decay or are already deposited in a waste disposal site is prevented through gasification to produce syngas/producer gas; or mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB).

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

Project activity involves the combustion of processed solid waste material to generate heat to produce steam for power generation. This does not involve recovery nor combustion of methane directly.
The produced RDF/SB was used for combustion off-site till April 2021 and then for grid power supply since that time.
Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually under AMS III. E.
Prior to gasification, the thermal treatment process (dehydration) of MSW occured under controlled conditions (up to 300 Celsius) and generated a stabilized biomass that was used as fuel material in other off-site industrial processes.
Project activity involves the avoidance of methane generation from MSW landfill sites through controlled combustion of processed MSW in boiler to produce electricity. In the absence of project activity, MSW in the landfill sites would have left to decay anaerobically and led to methane generation.
The annual average temperature of the biogas site is located is higher than 5°C
Stabilized biomass (SB) is refuse derived fuel (RDF) briquettes.
As the project activity involves both avoidance of methane and subsequent generation of electricity through controlled combustion and supply of power to grid, the project activity is also eligible under small scale methodology AMS I.D.
The power generation capacity of the plant is 0.6MWh which is less than eligible limit of 15 MW, the project is eligible under AMS I.D small scale category. The project does not co fire any fossil fuel for power generation.
Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually
In case of RDF/SB processing, the produced RDF/SB is not stored in such a manner as resulting in high moisture and low aeration favouring anaerobic decay

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

The gasifier, electricity meter unit and weigh bridge is located within the project boundary. Each electricity meter unit has a unique ID, which is visible on the unit. Details of the same will be provided to the UCR Verifier during verification. The project activity has not applied for carbon credits under any other GHG programs.

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

The project boundary are the physical, geographical sites:

(a) Where the solid waste is deposited and the avoided methane emission occurs in absence of the proposed project activity;

(b) Where the treatment of biomass through controlled gasification or mechanical/thermal treatment takes place;

(c) Where the final residues of the combustion process will be deposited (this parcel is only relevant to controlled combustion activities);

(d) All plants generating electricity at the project site,

	Source	GHG	Included?	Justification/Explanation
Baseline	Emissions from biomass 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	Emissions from RDF transport off site	CO_2	Included	Minor source of emissions
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

Leakage:

In case of RDF/SB production, PP has demonstrated that the produced RDF/SB is not subject to anaerobic conditions before its combustion end-use resulting in methane emissions.

Between 01/01/2017-31/03/2021, the produced RDF/SB was not used in captive facilities but sold to consumers outside the project boundary as a fuel, hence as a default, *0.0142 tCO2/tonne of biomass is* deducted as leakage to account for these potential methane emissions and in efforts to be conservative in the baseline estimates.

The project activity recovers and utilizes methane for producing electricity and applies this 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 from 01/04/2021-30/11/2022 is neglected.

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

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

- avoidance of methane emissions due to prevention of anaerobic decay of biomass in waste.
- displacement of electricity that would be provided to the grid by more-GHG-intensive means.

The yearly baseline emissions are the amount of methane that would have been emitted from the decay of the cumulative quantity of the waste diverted or removed from the disposal site, to date, by the project activity, calculated as the methane generation potential using the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".

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. 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.

In the case of project activities combusting, gasifying or mechanically/thermally treating only freshly generated wastes, the baseline emissions at any year y during the crediting period is calculated using the amount and composition of wastes combusted, gasified or mechanically/thermally treated since the beginning of the project activity (year "x=1") up to the year y, using the first order decay model as referred to in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".

Estimated Annual Emission Reductions: $BE_y = BE_{y1} + BE_{grid}\text{-}PE_{y,transport}$

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)* *subject to UCR verifier conservative estimates

BE_{y1}= Yearly Methane Generation Potential of the wastes diverted to be disposed in the landfill from the beginning of the project (x=1) up to the year y

$Be_{y1} = MB,y * GWP\_CH4$
Baseline emissions are calculated as per the formula given below:

Baseline emissions = Baseline emissions due to avoidance of methane production + Baseline emissions due to power generation

A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system*.

The UCR recommends an emission factor of 0.9 tCO2/MWh for the 2013-2022 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program*.

*If the UCR verifier establishes/suggests a more conservative estimate, then that value shall be incorporated and taken as the final emission factor during Baseline for Power calculations.

Estimated Annual Emission Reductions: $BE_y = BE_{y1} + BE_{grid}$

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}= Yearly Methane Generation Potential of the wastes diverted to be disposed in the landfill from the beginning of the project (x=1) up to the year y

$BE_{y1} = MB_{,y} * GWP_{\_CH4}$

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

Where

$$MBy = \frac{16}{12} . F . DOCf . MCF . \sum_{x=1}^{y} \sum_{J=A}^{D} Aj,x . DOCj . (1 - e^{-k_j}) . e^{-k_j . (y-x)}$$

$MB_{,y}$	Methane generation potential in the year 'y' (tonnes of CH_4), estimated as in AMS III-G
MCF	Methane correction factor (fraction, default value is 0.8)
DOC_j	is percent of degradable organic carbon (by weight) in the waste type j
DOC_f	fraction DOC dissimilated to landfill gas (default value used)
F	Fraction of methane in the project's landfill gas (default is 0.5)
k_j	is the decay rate for the waste stream type j
y	is year for which LFG emissions are calculated
x	is year since the landfill started receiving wastes: x runs from the first year of landfill operation (x=1) to the year for which emissions are calculated (x=y)
$A_{j,x}$	is amount of organic waste type j landfilled in the year x (tonnes/year)

MCF = 0.8 For projects utilising MSW, when calculating $BE_{CH4,SWDS,y,}$. Deep landfill (>5m) is most likely the technology for disposing MSW in the scenario of constrained availability of area/space within or close to urban areas and where waste scavenging does not occur. And it is also the least cost alternative for providing comparable level of service to the project technology for treating the waste i.e. composting in this case. MCF value is chosen from the definition provided in 2006 IPCC Guideline applicable to unmanaged deep landfills that do not have controlled placement of waste (i.e. waste

directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and do not include any cover material, mechanical compacting and levelling of the waste

Waste Type j	DOC(j) (% wet waste)
Wood and Wood Products	3.51
Pulp, paper and cardboard*	10.92
Food, Food waste, beverages and tobacco*	42.18
Textiles	24
Garden yard and park waste	30.2
Glass, plastic, metal, other inert waste	9.93

Project Emissions

Project emissisons consist of:

Project Emissions due to burning of plastics (non – biomass fuels) & auxiliary fuels fossil fuels used in the combustion, gasification or mechanical/thermal treatment facility is negligible and not estimated.

$PE_{y,transport}$ = Emissions due to the transport of RDF from processing plant to customers outside facility. General guidance on leakage in biomass project activities is followed to quantify leakages pertaining to the use of biomass residues In order to be conservative, the PP has applied the recommendation outlined as per paragraph 31 under Section 5.2 of the given methodology AMS-IC, wherein the PP must "*For microscale and small-scale project activities, apply a default emission factor of 0.0142 tCO2/tonne of biomass"*.

Year	Emission Reductions (tCO2eq)
2017	2337
2018	5488
2019	6426
2020	6790
2021	9941
2022	13889
Total	44871

Total emission reductions (ER_y) = 50400 tCO_{2eq} (50400 CoUs)

C.6. Prior History>>

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

C.7. Monitoring period number and duration>>

Monitoring Period Number: 01
Monitoring Duration: 01/01/2017 to 30/11/2022 (05 years, 11 months)

C.8. Changes to start date of crediting period >>

There is a minor change in the end date of the monitoring/crediting period as mentioned in the PCN.

The new start and end dates for the monitoring/crediting period is as follows:
1st Monitoring Period: 01/01/2017 to 30/11/2022
1st Crediting Period: 01/01/2017 to 30/11/2022

C.9. 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, except for the end dates to the creditign and monitoring period.

C.10. Monitoring plan>>

Parameters being monitored according to Monitoring Plan

Data variable	QA/QC procedures as per registered PDD	QA/QC procedures followed during the monitoring period
Quantity of waste processed in the plant (Fresh MSW wet waste)	Quantity of waste processed in the plant is measured using the weigh bridge at the entrance of the plant. Weigh bridge is calibrated on regular basis as per the procedures of Department of Weighs and Measurements, Government of Manipur, India.	Quantity of waste processed in the plant is measured using the weigh bridge at the entrance of the plant. Valid calibration certificate of weighbridge will be submitted to UCR verifier during the verification process.
Quantity of waste combusted in the gasifier (RDF)	Quantity of RDF combusted in the gasifier is measured using the weigh bridge before sending to the gasifier	Quantity of RDF processed in the plant is measured using the weigh bridge. Valid calibration certificate of weighbridge will be submitted to UCR verifier during the verification process.
Composition of waste processed (fresh MSW)	Composition of the MSW received in the plant is analyzed for representative sampling in Government accredited Laboratories. Representative sampling of the same will be furnished to the lab. As the composition is likely to change with the seasonal changes, the monitoring frequency of the same is considered monthly and the same will be reviewed time to time	Composition of the representative sampling of the waste processed is analyzed in the accredited laboratories. Copies of the test reports will be submitted to UCR verifier during the verification process.
Composition of RDF combusted (RDF)	Composition of the RDF combusted in the plant is analyzed. Composition of the representative sample of the RDF combusted is by sampling in Government accredited Laboratories. As the composition is likely to change with the seasonal changes, the monitoring frequency of the same is considered monthly and the same will be reviewed time to time	Copies of the test reports will be submitted to the UCR verifier.
Electricity generated	Generation meter in the control room is calibrated once in a year from authorized service centres	Generation meter in the control room is to be calibrated once in a year from authorized service centres. Since the electricity was supplied from April 2021, the earliest calibration is April 2022.
Power export	Export meter in the substation are to	As per export meter readings in sub

	be calibrated once in a year and the readings of the same are compared with the check meter installed in the sub station. Both the meters are calibrated on yearly basis which is statutory. (The electricity supply has started only in April 2021)	stations and recorded jointly with state grid officials.
No. of RDF truck loads from processing plant to downstream industries	All the truck movements from the Manipur plant are recorded at the entrance and maintained in log books for the period 01/01/2017 to 30/11/2022.	Relevant records will be provided to UCR verifier during the verification process.

Measures to ensure the results / uncertainty analysis

As per the Power Purchase Agreement (PPA), the energy exported to the Manipur State Power Company Ltd. (MSPCL) Grid is recorded from two independent meters viz., Main Meter and Check Meter and reading of main meter is used for billing. In the event of main meter not in operation / fails, the reading of the check meter shall be used for billing. The calibration of monitoring equipment is being maintained as per the requirement of MSPCL. Power generation, export & auxiliary consumption, fuel consumption are being recorded daily and the same is being verified by the Manager (O&M) and approved by the General Manager (Operation).

Instruments:

- Humidity Analyzer to check moisture content.
- Temperature measurement & controlling online
- ressure monitoring & required safety valve provision in chamber
- Water Level measurement,
- Gas flow meter with totalizer.
- Gas temperature meter & sensors.
- Online Gas analyzer.
- PCC Panel with required controls to feed Power to Fuel Preparation Section,
- Gasification Section & Power Generation Section
    - MCC + VFD Panel for complete Gasifier system.
    - The Panel comprises of: Ampere meter, voltmeter, digital temperature indicators, Change over switches, DOL starters, contactors, overload relays, push buttons, HRC fuse, MCB.
    - PLC PANEL IS PROVIDED WITH HMI OF 10” FOR EASY MONITORING, CONTROLLING & DATA LOGGING OF COMPLETE SYSTEM.

DETAILS OF GENERATION METER

DESCRIPTION	GENERATION METER
Serial No	X1191305
Type	E3T055, 3Ph 4wire
Accuracy Class	+/- 0.5
Make	Secure Meters Ltd

Data / Parameter:	Q_{waste}
Data Unit	
Description:	Quantity of MSW used/treated in the process each year.
Source of data:	Measured
Measurement procedures (if any):	On-site data sheets recorded monthly and daily using weigh bridge
Monitoring frequency:	Monthly-
QA/QC procedures:	Weighbridge is subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Any comment:	Log of data entry is provided to UCR verifier

Years	TPY
2017	20978
2018	27276
2019	8656
2020	6284
2021	684
2022Nov	27385

Data/Parameter	Number of Working Days for Project Activity per year
Data unit	330 days average
Description	Number of working days of the MSW plant site per year
Source of data Value(s) applied	Conservative estimate to offset repair and maintenance activities at the site
Measurement methods and procedures	Recorded in log books
Monitoring frequency	Recorded in log books
Purpose of data	To estimate baseline emissions

Sensor technology : CO,CO2,CH4 = NDIR H2 TCD, Oxygen = Electrochemical
Resolution : 0.1 mg/Nm3
Display : Graphic
Sampling Method : Extractive
Signal Output : 4-20Ma (Individual output)
Digital Output : RS 232/ RS 485(optional)
Digital Output : RS 232/ RS 485(optional Repeatability : +/-2% of FSC
Linearity : +/- 2% FSC
Zero drift : Less than 1% of calibrated Range span
Temperature Drift : Automatic
Temperature Compensation Response Time : Less than 10 seconds
Enclosure : Aluminum Case
Protection class : IP 65
Recommended Flow Rate : 3-5 LPM