



## Verification Report for

Project : Lamdeng Waste to Energy Project, Manipur  
UCR Project ID : 012

Name of Verifier	SQAC Certification Pvt. Ltd.
Date of Issue	January 30, 2023
Project Proponent	M/s IEC-TSL Ingenious Energy LLP
UCR Project Aggregator	M/s Gram Vikas Trust
Work carried by	Mr. Santosh Nair
Work reviewed by	Mr. Praful Shinganapurkar

### Summary:

SQAC Certification Pvt. Ltd. has performed verification of the “Lamdeng Waste to Energy Project, Manipur, India”. The project activity involves waste processing facility which treats 120 tonnes of Municipal Solid Waste (MSW) per day into Residue Derived Fuel (RDF). 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<sub>4</sub> and CO<sub>2</sub> 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.

Verification for the period: **01/01/2017 to 30/11/2022**

The GHG emission reductions were calculated on the basis of UCR Protocols which draws reference from, UCR Protocol Standard Baseline, CDM UNFCCC Small-scale Methodology, AMS.I.D. Grid connected renewable electricity generation and AMS-III.E Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment. Owing to the Covid pandemic, the verification was done remotely by way of video calls / verification, phone calls and submission of documents for verification through emails.

SQAC is able to certify that the emission reductions from Lamdeng Waste to Energy Project, Manipur, India, (UCR ID – 012) for the period **01/01/2017 to 30/11/2022** amounts to **45,780 CoUs (45,780 tCO<sub>2</sub>eq)**



## **Detailed Verification Report:**

### **Purpose:**

The project activity by Lamdeng Waste to Energy Project, Manipur, India, involves the processing of Municipal Solid Waste (MSW) into Refuse 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.

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.





Electronic Truck Weigh Bridge (Incoming MSW)



Electronic Weigh Bridge (Incoming MSW)



Unloading Process (MSW)





**Location of project activity:**

Country: India.

District: Imphal West

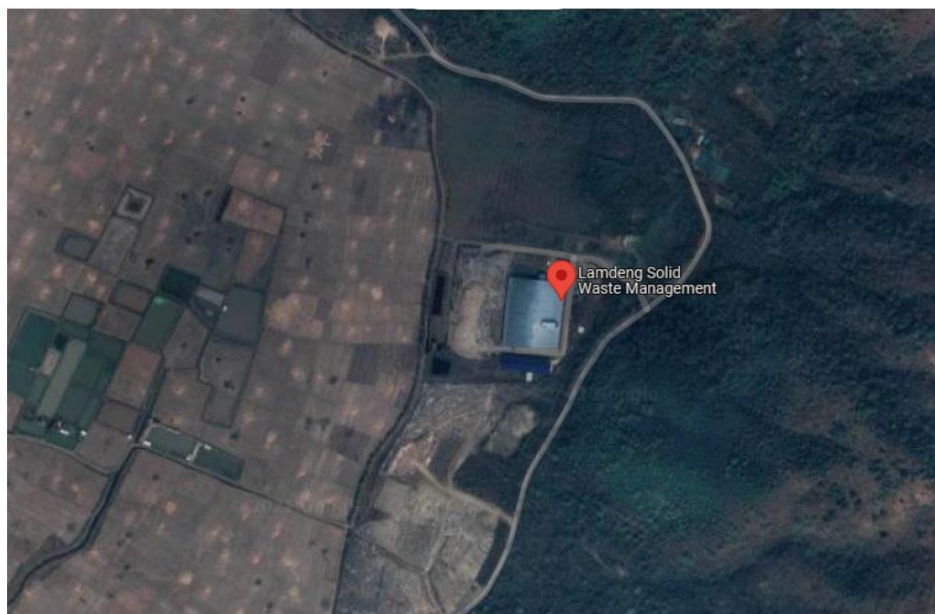
Village: Lamdeng

State: Manipur

Code: 795001

Latitude: 24° 50' 25.224" N

Longitude: 93° 53' 23.424" E





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

### **Scope:**

The scope covers verification of emission reductions from the project - Lamdeng Waste to Energy Project, Manipur, India, (UCR ID – 012).

### **Criteria:**

Verification criteria is as per the requirements of UCR Standard.

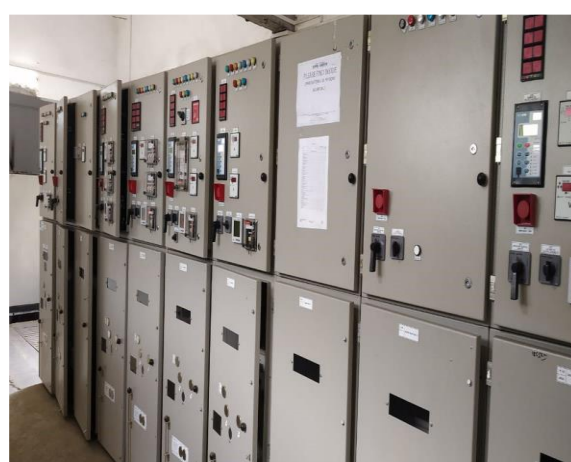
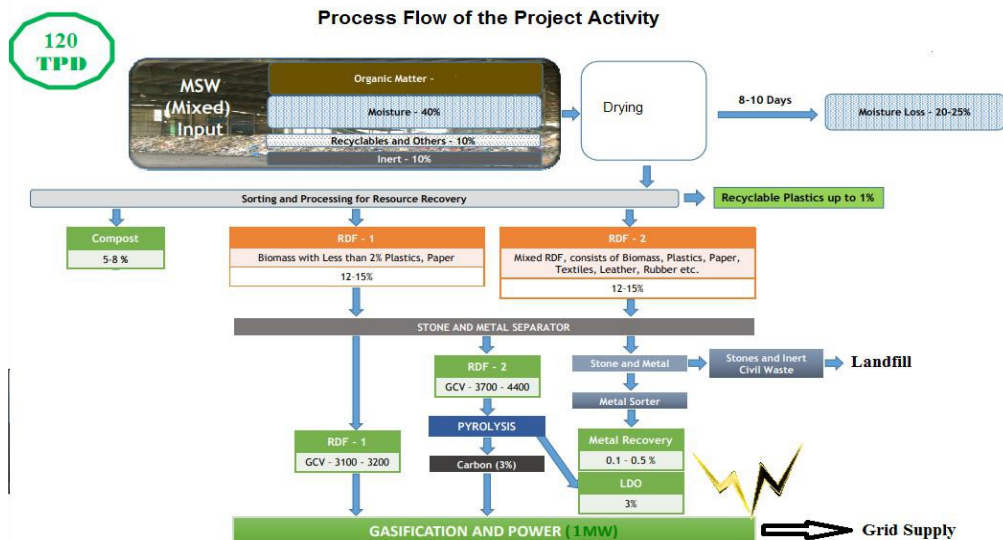
### **Description of project:**

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-CO<sub>2</sub> 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.





#### 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

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 in this crediting period (tCO <sub>2eq</sub> )	45,780 tCO <sub>2eq</sub>
Leakage	NA





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.

**Level of Assurance:**

The verification report is based on the information collected through interviews conducted over video calls / phone calls, supporting documents provided during the verification, Project Concept Note (PCN) / Monitoring Report (MR), submitted to SQAC. The verification opinion is assured provided the credibility of all the above.

**Verification Methodology:**

Review of the following documentation was done by SQAC Verifier, Mr. Santosh Nair, who is experienced in such projects.

**Documentation Verified:**


- Project Concept Note (PCN)
- Monitoring Report (MR)
- Calibration Reports
- Gas Engine Logbook
- Gasifier Commissioning report
- M/s. IEC-TSL Ingenious Energy LLP Invoices
- Month wise MSN input data
- M/s. IEC-TSL Ingenious Energy LLP Purchase Order
- Data provided upon request of all the documents of the related projects

**Sampling:**

Not applicable







# EARTH INSTRUMENT

Electronic Load Top Scale, Platform Scale, P1 is base Weighbridge, P1 type weighbridge, Mobile weighbridge, weighbridge Digital Load System, Rechargeable to Fully Electronic Conversion, weighbridge Demurring

www.earthinstrument.com.au

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COMPANY NAME

COMPANY ADDRESS

COMPANY PHONE

COMPANY FAX

COMPANY E-MAIL

COMPANY WEBSITE

COMPANY TYPE

COMPANY CONTACT

COMPANY ADDRESS

COMPANY PHONE

COMPANY FAX

COMPANY E-MAIL

COMPANY WEBSITE

COMPANY CONTACT

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WEIGHBRIDGE TYPE

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WEIGHBRIDGE PRESSURE

WEIGHBRIDGE WIND SPEED

WEIGHBRIDGE WIND DIRECTION

WEIGHBRIDGE RAINFALL

WEIGHBRIDGE SUNLIGHT

WEIGHBRIDGE MOONLIGHT

WEIGHBRIDGE STARS

WEIGHBRIDGE PLANETS

WEIGHBRIDGE ZODIAC

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WEIGHBRIDGE METEOROLOGICAL

WEIGHBRIDGE CLIMATOLOGICAL

WEIGHBRIDGE GEOLOGICAL

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WEIGHBRIDGE ZOOLOGICAL

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[illegible]


  
ISO 9001:2015, ISO 14001:2015

Date: 05-10-2017

To:  
**REC-TS Ignite Energy LLP**  
 Solid Waste Management Plant,  
 Village: LAMBHOLI, Imphal West,  
 MANIPUR-795146

Kind Attn.: Mr. Vipul Chaturvedi & Mr. Ravi Kalant  
 Sub: Successful completion of Gasifier Commissioning

Dear Sirs,

We hereby confirm that we, have successfully completed Erection & Commissioning of  
 improved 1.5 MW Gasifier against our PO No. RC19/06/1718/01-02-10-09-2017 at Imphal,  
 Manipur-India.

Below is Final Commissioning Report:

- Input MSW on an average = 65 TPD with Inlet moisture of average 25%
- Treatment by "Biomass" culture, processing & Segregation was done on incoming MSW for resource recovery.
- Compost recovered = Average 5 TPD
- RDF recovered = Average 32 TPD
- RDF = Briquettes manufactured = Average 30 TPD
- Gasification of RDF Briquettes for Syngas Production

Syngas Produced from Gasifier with MSW - RDF briquettes is:  
 CO = 10 - 22%    CH<sub>4</sub> = 5 - 8%    H<sub>2</sub> = 1-12%  
 CO<sub>2</sub> = 6 - 8%    N<sub>2</sub> = 52 - 58%    O<sub>2</sub> = Nil

The Syngas produced is in range of Gas Engine requirement to produce power.

Thanking you,  
 For, **Thermotech Systems Ltd.**


  
**Mr. Vipul Chaturvedi**  
 Authorized Signatory

**Thermotech Systems Ltd.**  
Plot No. 2027-03, D.I. 01, D.I. C, Phase II, Village: Ambabeddi 795 403, Imphal  
 T: 0379-2566222 F: 0379-2566224 E: info@thermotechsystems.in

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Date: 19/11/2018  
 Page No. 1 of 1

**GAS ENGINE LOG BOOK**

Sl. No.	Date	Engine Speed (RPM)	Engine Temp (°C)	Coolant Temp (°C)	Oil Temp (°C)	Air Temp (°C)	Water Temp (°C)	Fuel Temp (°C)	Exhaust Temp (°C)	Vib. (mm/s)	Noise (dB)	Remarks
1	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine started successfully
2	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
3	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
4	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
5	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
6	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
7	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
8	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
9	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
10	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
11	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
12	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
13	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
14	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
15	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
16	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
17	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
18	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
19	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
20	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
21	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
22	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
23	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
24	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
25	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
26	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
27	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly
28	19/11/2018	1500	75	70	75	70	70	70	70	0.5	75	Engine running smoothly



**Person interviewed:**

1. Mr. Madhurijit RK Rajkunar : M/s. IEC-TSL Ingenious Energy LLP

**Corrective Action Requests (CARs)**

Corrective Action Requests (CARs) and their resolutions are listed below

**CAR 1:**

ER calculations referred in MR considers estimation of Baseline emissions due to methane avoidance for the year 2022 as 5501 whereas it should be 3440.

**Response from Project Participant**

The correction has been made in the Monitoring Report (V02) as it was a formula over writing error

**Conclusion by Verification Team**

Verified Monitoring Report (V02) for correction and found to be matching as per requirement. Hence Corrective Action Request CAR-1 is closed.

**CAR 2:**

MR considers the total Emission Reductions (tCO<sub>2</sub>eq) for the year 2021 and 2022 as 9,941 and 19,418 respectively which makes the total Emission Reductions (tCO<sub>2</sub>eq) for the crediting period to 50,400, whereas the figures should be 9,951 and 13,890 respectively thus making the total Emission Reductions (tCO<sub>2</sub>eq) for the crediting period to 45,780.

**Response from Project Participant**

The correction has been made in the Monitoring Report (V02) as it was a formula over writing error

**Conclusion by Verification Team**

Verified Monitoring Report (V02) for correction and found to be matching as per requirement. Hence Corrective Action Request CAR-2 is closed.



### Applied methodologies and standardized baselines:

UCR Protocol Standard Baseline

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).

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





## **Application 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 CO<sub>2</sub> equivalent annually under AMS III. E.
- Prior to gasification, the thermal treatment process (dehydration) of MSW occurred 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 0.6 MWh 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 CO<sub>2</sub> 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.

## **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.



## Project boundary, sources and greenhouse gases (GHGs)

- (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 <sub>2</sub>	Included	Major source of emission
		CH <sub>4</sub>	Included	Major source of emission.
	Emissions from electricity generated using fossil fuels	N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Emissions from RDF transport off site	CO <sub>2</sub>	Included	Minor source of emissions
		CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative.
		N <sub>2</sub> O	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 tCO<sub>2</sub>/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.

### **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”.





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

$BE_y$  = 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 (tCO<sub>2e</sub>)

$EG_{y,grid}$  = Amount of grid electricity displaced by project in year y (MWh)

$EF_{y,grid}$  = Emission factor of the grid (t CO<sub>2e</sub>/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

$$Be_{y1} = MB_{y1} * GWP_{CH_4}$$

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<sub>2</sub> emission factor (tCO<sub>2</sub>/MWh) which will be associated with each unit of electricity provided by an electricity system\*.

- ❖ The UCR recommends an emission factor of 0.9 tCO<sub>2</sub>/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.

**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 (tCO<sub>2e</sub>)

$EG_{y,grid}$  = Amount of grid electricity displaced by project in year y (MWh)

$EF_{y,grid}$  = Emission factor of the grid (t CO<sub>2e</sub>/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  $y$

$$BE_{y1} = MB_{,y} * GWP_{CH_4}$$

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

Where

$$MB_y = \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^y \sum_{j=1}^D A_{j,x} \cdot DOC_j \cdot (1 - e^{-k_j}) \cdot e^{-k_j \cdot (y-x)}$$

$MB_{,y}$	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  $BE_{CH_4,SWDS,y}$ , . 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 emissions 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 tCO<sub>2</sub>/tonne of biomass”.

Mwh	Year	Total Baseline Emissions power tCO <sub>2</sub>
3859.2	2021	3467
4910.4	2022	4419
	Total (tCO <sub>2</sub> )	7886

Summary of year wise baseline emissions	w.r.t share of waste degraded in year x,						Baseline emissions for the grid	Total
Jan 2017 – Dec 2017	2635							2635
Jan 2018 – Dec 2018	2449	3426						5875
Jan 2019 – Dec 2019	2278	3185	1087					6550
Jan 2020 – Dec 2020	2118	2961	1011	789				6879
Jan 2021 – Dec 2021	1970	2754	940	734	86		3467	9951
Jan 2022 – Dec 2022	1833	2562	874	682	80	3440	4419	13890

Project Emissions						
Year	2017	2018	2019	2020	2021	2022
TPY Biomass Treated	20978	27276	8656	6284	684	NA
PE = Emission Factor (0.0142/t)*TPY	297.8876	387.3192	122.9152	89.2328	9.7128	0





Year	Baseline Emissions	Project Emissions (tCO <sub>2</sub> )	Emission Reductions
2017	2634.925918	297.8876	2635
2018	5875.44467	387.3192	5875
2019	6549.600317	122.9152	6550
2020	6879.406603	89.2328	6879
2021	9950.71481	9.7128	9951
2022	13889.7317	0	13890
TOTAL			<b>45780</b>

**Total emission reductions (ER<sub>y</sub>) = 45,780 tCO<sub>2</sub>eq (45,780 CoUs)**

### **Conclusions:**

Based on the audit conducted on the basis of UCR Protocol, which draws reference from UCR Protocol Standard Baseline, CDM UNFCCC Small-scale Methodology, AMS.I.D. Grid connected renewable electricity generation and AMS-III.E Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment, the documents submitted during the verification including the Data, Project Concept Note (PCN) / Monitoring Report (MR), SQAC is able to certify that the emission reductions from the project - Lamdeng Waste to Energy Project, Manipur, India (UCR ID – 012) for the period **01/01/2017 to 30/11/2022** amounts to **45,780 CoUs (45,780 tCO<sub>2</sub>eq)**