WASTE TO ENERGY PROJECTS BY MAHINDRA WASTE TO ENERGY SOLUTIONS LIMITED

Document Prepared by Infinite Solutions

Project Title	Waste to Energy Projects by Mahindra Waste to Energy Solutions Limited
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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

Mahindra & Mahindra with their engineering prowess has proved the benefits and unexplored potentials of biogas utilisation by installing biogas plant with purification system to produce bio-CNG gas which is equal to CNG gas in terms of quality and calorific value.

Biogas technology provides an alternate source of energy in India, and is hailed as an archetypal appropriate technology that meets the basic need for cooking fuel in rural and urban areas. Using local resources, viz. food waste, cattle waste, vegetable and other organic wastes, energy and manure are derived. Realization of this potential and the fact that India supports the largest cattle wealth led to the promotion of National Biogas Programme in a major way in the late 1970s as an answer to the growing fuel crisis. As an extension of technology, Mahindra in the process of developing alternate fuel technologies for rural and urban India for quite long time.

The details of Project capacity and location details for all the bundle partners are as follows:

Sl No.	Project Owner	Plant Location	Technology	Capacity (TPD)	Usage	Commissioning Date
1	Mahindra Waste To Energy Solutions Ltd.	Indore – MP	Bio Methanation	20	CNG sale	01/04/2018
2		Aurangabad – Maharashtra	Bio Methanation	30	CNG sale	Expected in Mar 2020
3		Tirupati – AP	Bio Methanation	40	CNG sale	Expected in Mar 2020
4		Piduguralla – AP	Bio Methanation	20	CNG sale	Expected in Mar 2020
5		Adoni – AP	Bio Methanation	20	CNG sale	Expected in Mar 2020
6		Udaipur – Rajasthan	Bio Methanation	20	CNG sale	Expected in May 2020

The main purpose of the project is to incorporate competent biogas technology and implementation to support in the country by setting up to field scale biogas plant; to be located based on the continuous availability of raw materials. Anaerobic digestion is the prominent technology used for degradation of biodegradable organic waste.

Anaerobic Digestion (AD) is a biological process that happens naturally when bacteria breaks down organic matter in environments with little or no oxygen. It is effectively a controlled and enclosed version of the anaerobic breakdown of organic waste in landfill which release methane.
The project activity involves the establishment of biogas plants in various cities, municipal corporations to generate energy out of waste, thereby solving two major issues for the country. The biogas generated shall be used for various thermal applications such as use in vehicles or bottled for use. The project activity is expected to generate approximately M3 of Biogas for supply in Domestic market of the country. In the absence of the project activity, the accordant amount of CNG (fossil Fuel based) would have been delivered through the current supply mix of the country, leading to carbon dioxide emissions.

The project involves various bundle component by the group. The unit at Indore has also been described as part of another project which is currently under Validation. However the ownership of the project shall be demonstrated. The unit shall be delisted from the other project.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Methodology for Energy Use

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)

Project Type : I - Renewable Energy Projects

Methodology : AMS I.D, Grid connected renewable electricity generation and ACM0002, Grid-connected electricity generation from renewable sources --- Version 20.0

Methodology for Waste Management

Sectoral scopes : 01 and 13

Methodology : ACM0022, Alternative waste treatment processes Version Number: 02.0

The project is a grouped project activity developed by Mahindra Group.

1.3 Project Proponent

Organization name	MAHINDRA WASTE TO ENERGY SOLUTIONS LTD.
Contact person	Mr. Shashi Shekar
Title	-
Address	Mahindra Towers Dr. GM Bhosale Marg, Worli, Mumbai – 400 018
Telephone	-
Email	Shahi.shashishekhar@mahindra.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Project Consultant

Contact person	Mr. Jimmy Sah
Title	Head – Sustainability
Address	611, Chetak Centre Main, 12/2 RNT Marg, Indore- 452001
Telephone	+91-9644130430
Email	jimmy@infisolutions.org

1.5 Project Start Date

Project Start Date: 01/04/2018;
The project activity at Indore site was commissioned and started operation on 01/04/2018. Hence the project start date is defined as the earliest commissioning date within all the units.

1.6 Project Crediting Period

Project crediting period: Renewal crediting period

Start date of Crediting period: 01/04/2018
End date of crediting period: 31/03/202
Total number of years: 10

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	✓
Large project	-

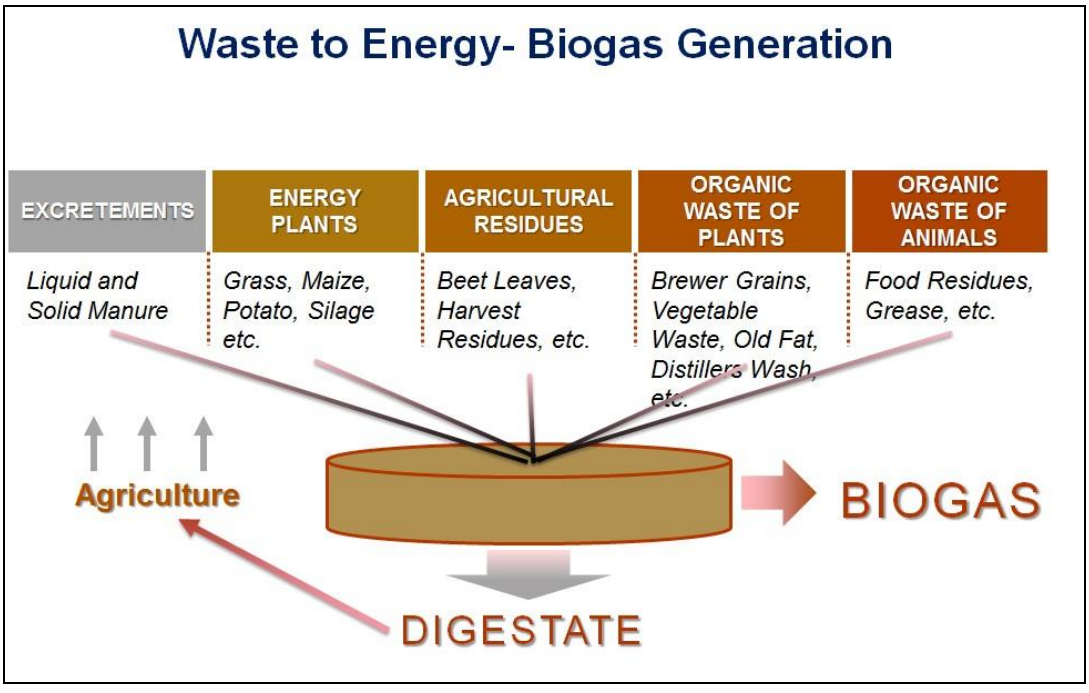
Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	38,617
Year 2	38,617
Year 3	38,617
Year 4	38,617
Year 5	38,617
Year 6	38,617
Year 7	38,617
Year 8	38,617
Year 9	38,617
Year 10	38,617
Total estimated ERs	386,170
Total number of crediting years	10
Average annual ERs	38,617

1.8 Description of the Project Activity

Description of project activity

Anaerobic digestion is a complex, natural, multi-stage process of degradation of organic compounds through a variety of intermediates into methane and carbon dioxide, by the action of a consortium of microorganisms. The interdependence of the bacteria is a key factor in the anaerobic digestion process. Instability during both the start-up and operation of the anaerobic degradation process can be problematic due to the low specific growth rate of the methanogenic microorganisms involved. The amount of one type of organic waste generated at a particular site at a certain time may not be sufficient to make anaerobic digestion cost-effective all year round. Co-digestion then becomes an interesting alternative as it is a well-established concept. Raw Material for biogas production:

- Agricultural residue
- Energy crops
- diary manure and biomass
- Food, fruit and vegetable waste
- Animal waste
- Municipal waste

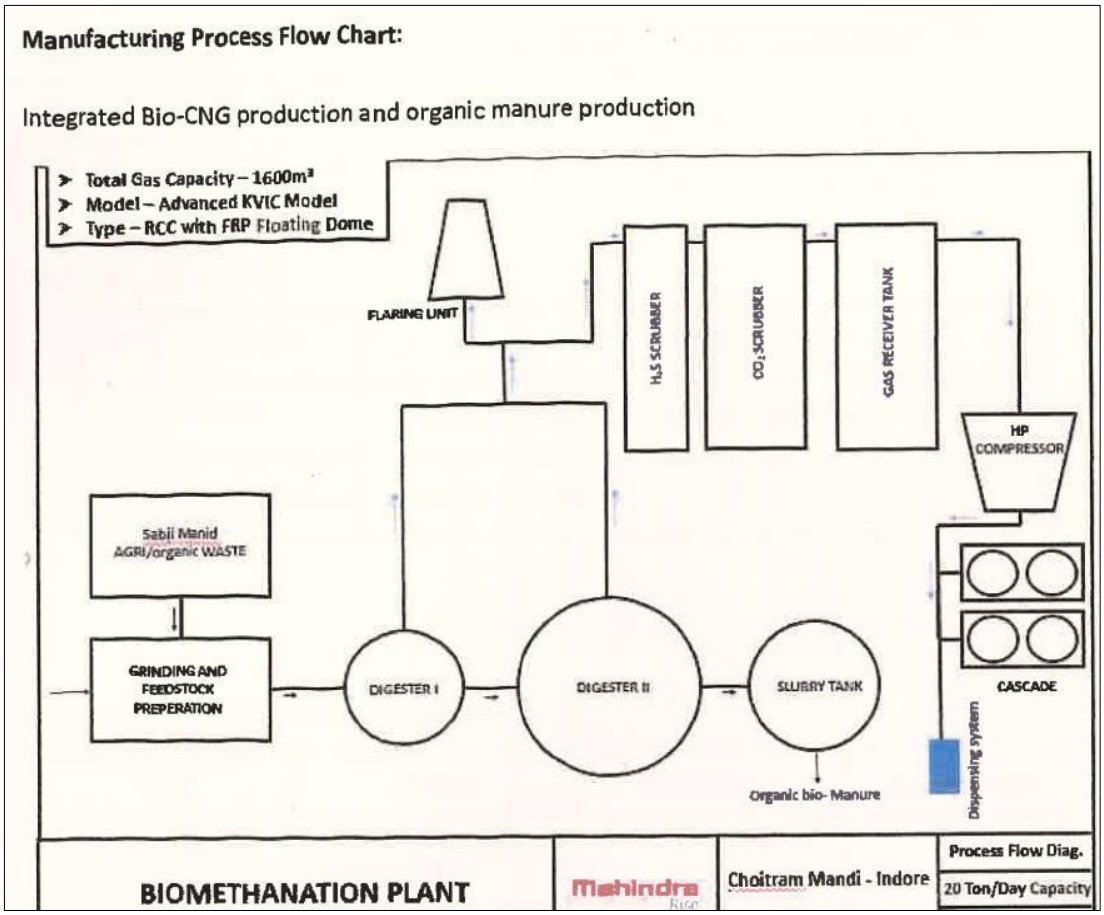


There are mainly two products will produced from the plant. They are

1. Organic/ Bio manure
2. Biogas

Biogas plant slurry is an organic matter and it has rich nutrition content. Thus the slurry can be de-watered or it can be mixed with garden waste to produce Organic manure/fertilizer for cultivation/horticulture. Manure is an excellent fertilizer containing nitrogen, phosphorus, potassium and other nutrients. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture-holding capacity, and water infiltration. Ever since agriculture has evolved, animal waste has been treated as a fertilizing element for the soil. The first step towards civilization was plantation and as time progressed, human beings developed new techniques of plantations and looked forward to improvise on the previous ones. It was a simple observation that the primitive man made, that led him to treat animal waste as manure.

Biogas generated can be converted into bio methane with the help of two steps; a cleaning process to remove the trace components and an upgrading process to adjust the calorific value. Upgrading is generally performed in order to meet the standards for use as vehicle fuel or for injection in the natural gas grid. A number of techniques are available for the up gradation of biogas. These techniques include chemical absorption method, high pressure water scrubbing, pressure swing adsorption, cryogenic separation and membrane separation method.



1.9 Project Location

The grouped projects are under implementation and are located across the country. The geological coordinates are as follows;

Sl No.	Location	Technology	Capacity	Plant Location	Latitude and Longitude
1	Choitram	Bio Methanation	20	Krishi Mandi, Indore, Madhya Pradesh 452009	22°40'59.2" N 75°51'08.4" E
2	Aurangabad	Bio Methanation	30	Aurangabad Industrial Area	19° 54' 3.7" N 75° 21' 8.9" E
3	Tirupati	Bio Methanation	40	Temple city, Tirupati	13° 37' 44.6" N 79° 25' 28.0" E
4	Piduguralla	Bio Methanation	20	Piduguralla town, Guntur District	6° 29′ N 79° 54′ E
5	Adoni	Bio Methanation	20	Adoni town, Guntur District	15° 37′ 28″ N 77°16′ 23″ E
6	Udaipur	Bio Methanation	20	Udaipur town	24° 34' 16.5" N 73° 41' 29.5" E

The new instances as added would be updated during the Verification period.

Project Location across the country

1.10 Conditions Prior to Project Initiation

In the absence of the bio-methanation project activity, the waste material would have been dumped unscientifically and ordinary landfills thereby allowing them to undergo anaerobic decomposition resulting emission of methane gas. The baseline identified in section 2.4 is same as the pre-project scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning in the name of each individual project owners and is in compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006
- Solid waste management Rules, 2016

The Project activity conforms to all the applicable laws and regulations in India:

1. Generation of bio CNG from Waste is not a legal requirement or a mandatory option.
2. There are state and sectoral policies, framed primarily to encourage waste to Energy projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
3. The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
4. There is no legal requirement on the choice of a particular technology for power generation.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The respective commissioning certificate for project activity are the supporting documents to demonstrate the project ownership. This demonstrates the right of use according to clause 3.11.1 (3) of VCS Standard (v3.7) – “a project ownership arising by virtue of a statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions and/or removals”. Also other legal compliances may be considered;

- Consent to Operate
- Commissioning certificate
- Consent to Establish

1.12.2 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.12.3 Other Forms of Environmental Credit

The Project has no intent to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

The initial project activity instances are neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.12.4 Participation under Other GHG Programs

The Project has not participated in any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is a grouped project, the eligibility criteria for inclusion of new instances of each project activity has been defined below:

S. no.	Eligibility Criteria	Project Activity instances eligibility
1	Applicability Conditions: The project activity instances shall meet applicability conditions for applicable methodology as defined in section 2.2	The current instances described are in line with the methodology
2	Geographical Area: The project activity instances to be included in the grouped project activity will be activities involving waste to Energy projects in India	All the instances are located within the boundary of the country, India.
3	Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective valid methodology and as explained in section 2.4	The baseline for each instance is inline with the methodology requirements.
4	Start Date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each	The data of the first commissioning is 01/04/2020. All other instances shall be subsequent to this date. The commissioning certificate shall act as the evidence to determine the same

	project activity instance will be determined through documentary evidence.	
5	Conditions that avoid double counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program for any given monitoring period.	The initial project activity instances – has not applied in any other mechanism. Declaration needs to be provided that for any given monitoring period, the carbon credits would be issued in only one mechanism.
6	The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations.	Local stakeholder consultation has been conducted at the project site for initial project activity instances. Details are mentioned in subsequent section of this document. Hence, this condition is fulfilled.

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment, Forest and Climate Change (MoEFCC), has mentioned four indicators for the sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India .Thus the project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

Social well being

The project activity will provide job opportunity to local people during erection, commissioning and maintenance of the project. This directly and indirectly positively effects the economy of nearby populace.

Environmental well being

Bio CNG generation is one of the cleanest renewable energy powers and does not involve any fossil fuel. There are no GHG emissions. The impact on land, water, air and soil is negligible. Thus, the project activity contributes to environmental well-being without causing any negative impact on the surrounding environment.

Further the project leads to generation of energy from waste thus solving a major environmental concern for waste management.

Economic well being

The project activity generates permanent and temporary employment opportunity within the vicinity of the project.

Technological well being

The Project will also contribute towards achieving sustainable waste management in the city. The design and operation of this project, in conjunction with the avoidance of methane emissions and production of compost as a soil amendment, will serve as an example to many other urban areas in the country that are facing similar waste management challenges..

Further Information

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Methodology:
Methodology : ACM0022 Project Type
Sectoral scopes: 01 and 13
Title : Alternative waste treatment processes [1],
Version Number: 02.0
The methodology refers to following CDM tools:

- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion6, Version 3.0, EB 96, Annex 4
- Emissions from solid waste disposal sites7, Version 08.0, EB 94, Annex 7
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation8, Version 03.0, EB 96, Annex 5
- Project and leakage emissions from composting9, Version 2.0, EB 96, Annex 6

2.2 Applicability of Methodology

The following steps will show the applicability of the project under this methodology;

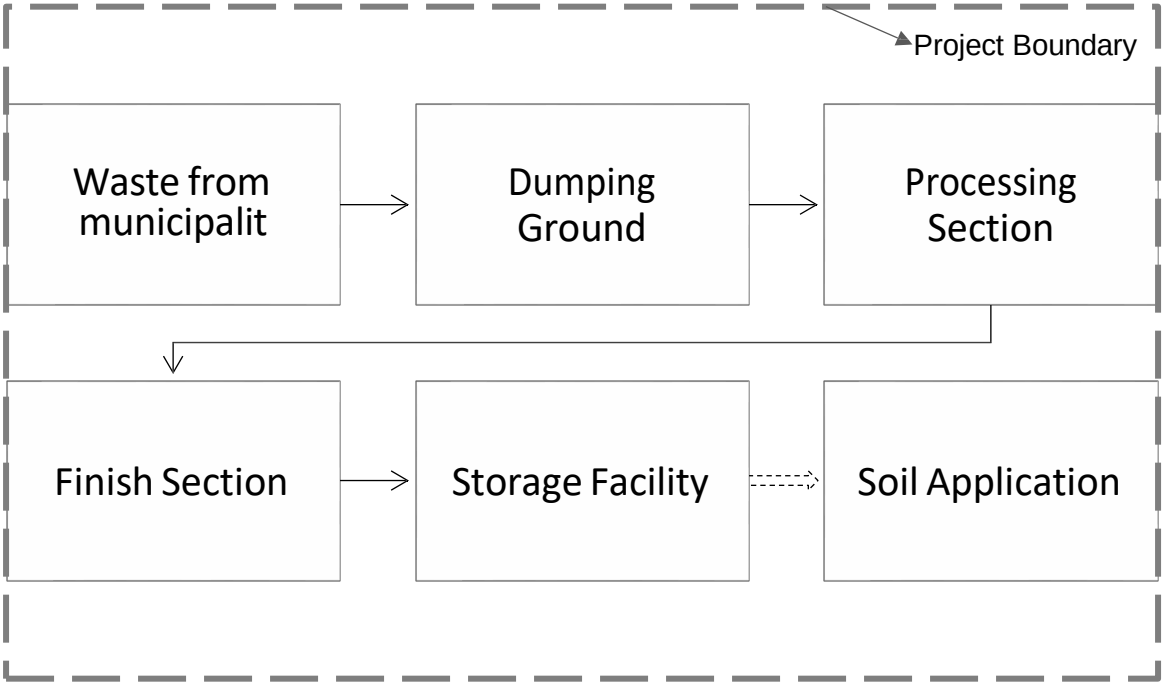
[1] https://cdm.unfccc.int/methodologies/DB/YINQ0W7SUYOO2S6GU8E5DYVP2ZC2N3

Applicability Criterion	**Project Case**
the following general applicability conditions apply to all project activities using this methodology: a) The project activity involves the construction of a new plant to implement one or several of the alternative waste treatment options provided in Methodology Table; b) In the project plant, except for the case of composting, co-composting and anaerobic digestion, only wastes for which emission reductions are claimed (fresh waste or wastewater) are processed. In the case of anaerobic digestion, only run-off wastewater may be processed in addition to fresh waste and wastewater; c) Neither organic fresh waste nor products and by-products from the waste treatment plant established under the project activity are stored on-site under anaerobic conditions. For example, no organic materials are stored in a stockpile that is considered a SWDS; d) Any run-off wastewater is treated within the project boundary; e) The project does not reduce the amount of waste that would be recycled in the absence of the project activity.	a) This project activity is anaerobic digestion of the organic fraction of municipal solid waste and biomass waste collected from door to door waste collecting vehicles. b) Not applicable as the project activity involves anaerobic digestion. c) Neither the organic fresh waste nor the product and by-product from the waste treatment plant are stored on-site under anaerobic conditions. d) No run-off wastewater is treated within project activity. e) The project does not reduce the amount of waste that would be recycled in the absence of the project activity. Hence the project activity meets the given applicability criterion.
Finally, the methodology is only applicable if the procedure for the selection of the most plausible baseline scenario, as outlined below, results in that the baseline scenario is: a) The disposal of the fresh waste in a SWDS with or without a partial LFG capture system (M2 or M3); and in this case, it shall be demonstrated that land is available to construct a new SWDS with a comparable annual waste acceptance rate and operating lifetime as the project activity; b) In the case of co-composting or the use of wastewater in an anaerobic digester: the treatment of organic wastewater in an existing or new to be built anaerobic lagoon or sludge pit without methane recovery (W1 or W4); c) In the case that the project activity generates electricity: the electricity is generated in an existing/new captive fossil fuel fired power-only plant, captive cogeneration plant and/or in the grid (P2, P4 or P6); In the case that the project activity generates heat and this displaces heat generation in the baseline: the heat is generated in an existing/new fossil fuel fired cogeneration plant, boiler or air heater (H2 or H4).	a) The disposal of fresh waste in a SWDS is without a LFG capture system. Also, project activity are constructed in conjunction with the local municipality which have land for construction of SWDS. b) This is not a co-composting project activity. c) These project activity does not generates electricity. Project activities doesn't generates electricity.

Under this methodology, emission reductions can only be claimed for the baseline scenarios indicated above. If project participants wish to claim emission reductions from the use of the products or by-products in other activities than those specified above, then they may request registration for a separate project activity, applying a relevant methodology.	The emission reduction are claimed only for the baseline scenarios, the project activity doesn't claim emission reductions from the use of product or by-products.
In addition, in the particular case where heat is generated from combustion of a product or by-product from the waste treatment options and used in the cement industry, the emission reductions for this use shall not be claimed under this methodology but in a separate project activity, applying the relevant methodology (e.g. "ACM0003: Partial substitution of fossil fuels in cement or quicklime manufacture").	Not applicable for the project activity.
Note that in the case that applicable laws or regulations require the use of the waste treatment option(s) implemented under the project activity, the compliance rate of such laws and regulations should be below 50 per cent in the period for which issuance of CERs is requested in order to claim emission reductions for that period.	The Union Ministry of Environment, Forests and Climate Change (MoEF&CC) notified the new Solid Waste Management Rules (SWM), 2016 which only advised the processing of bio-degradable waste. The various technological construction are solely initiatives by Indore Municipal Corporation.

2.3 Project Boundary

The boundary for the project is as follows;



Source		Gas	Included?	Justification/Explanation
Baseline	Emissions from heat generation	CO2	Yes	Major emission source if heat generation is included in the project activity and displaces more carbon intensive heat generation in the baseline
		CH4	No	Excluded for simplification. This is conservative
		N2O	No	Excluded for simplification. This emission source is assumed to be very small
	Emissions from decomposition of waste at the SWDS	CH4	Yes	The major source of emissions in the baseline
		N2O	No	N2O emissions are small compared to CH4 emissions from landfills. Exclusion of this gas is conservative
		CO2	No	CO2 emissions from the decomposition of fresh waste are not accounted for
	Emissions from anaerobic lagoons or sludge pits	CO2	No	CO2 emissions from biomass source are considered GHG neutral
		CH4	Yes	Methane emission from anaerobic process
		N2O	No	Not significant. Excluded for simplification and conservativeness
Project activity	Emissions from use of natural gas	CO2	No	Excluded for simplification. This is conservative
		CH4	No	Major emission source if supply of upgraded biogas through a natural gas distribution network is included in the project activity
		N2O	No	Excluded for simplification. This is conservative
	Emissions from on-site fossil fuel consumption due to the project activity other than for electricity generation	CO2	Yes	May be an important emission source. Includes heat generation for mechanical/thermal treatment process, start up of the gasifier, auxiliary fossil fuels needed to be added into incinerator, etc. It does not include transport
		CH4	No	Excluded for simplification. This is conservative
		N2O	No	Excluded for simplification. This is conservative
	Emissions from on-site electricity use	CO2	Yes	May be an important emission source
		CH4	No	Excluded for simplification. This emission source is assumed to be very small
		N2O	No	Excluded for simplification. This emission source is assumed to be very small
		N2O	Yes	N2O may be emitted from composting, incineration, syngas produced and RDF/SB combustion

	Emissions from wastewater treatment	CO2	Yes	CO2 emissions from incineration, gasification or combustion of fossil based waste shall be included. CO2 emissions from the decomposition or combustion of fresh waste are not accounted
		CH4	Yes	CH4 leakage from the anaerobic digester and incomplete combustion in the flaring process are potential sources of project emissions. CH4 may be emitted from incineration, gasification, composting and RDF/SB combustion
	Emissions from wastewater treatment	CO2	No	CO2 emissions from the decomposition of fresh waste are not accounted
		CH4	Yes	CH4 emissions from anaerobic treatment of wastewater are accounted for. Aerobic treatment of wastewater shall not result in CH4 emissions
		N2O	No	Excluded for simplification. This emission source is assumed to be very small
	Greenfield Solar Power Project Activity.	CO2	No	No CO2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	Project activity does not emit other forms of GHG emissions

2.4 Baseline Scenario

The baseline scenario 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 is due to methane emissions avoidance through anaerobic decomposition of MSW in a landfill site in a windrow composting process. No landfill gas capture system is installed in the Landfill site and there is no legal or regulatory mandate on the project proponent to recover the landfill gas.

Also Natural gas used from the natural gas network in the absence of the project activity is considered for estimation of baseline emissions.

2.5 Additionality

The waste to energy project activity includes processes of MSW characterization, anaerobic decomposition and automation monitoring which requires high technology. It demands high initial

capital investment and O&M costs. Moreover the sale of generated compost and Bio CNG faces marketing risks and low return on investment (ROI). Thus taking the financial and marketing barriers, this alternative without Carbon revenue support is not viable.

2.6 Methodology Deviations

There is no methodology deviation.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions are determined according to equation (1) and comprise the following sources:

(a) Methane emissions from the SWDS in the absence of the project activity;

(d) Natural gas used from the natural gas network in the absence of the project activity.

Procedure (A): Baseline emissions of methane from the SWDS (BECH4,y)

Baseline emissions of methane from the SWDS are determined using the methodological tool "Emissions from solid waste disposal sites". The following requirements shall be complied with when applying the tool:

(a) Wj,x in the tool is the amount of organic fresh waste prevented from disposal in the baseline SWDS due to its treatment in any (combination) alternative waste treatment option;

(b) Emissions are calculated using Application B in the tool, meaning that only waste avoided from the disposal after the start of the first crediting period shall be considered in the tool;

(c) Sampling to determine the fractions of different waste types is necessary (note that for the case that the waste is combusted in the project activity, then the parameter Qj,c,y in this methodology is equivalent to the variable Wj,x in the tool);

(d) The tool instructs that fy shall be determined based on historic data or contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available). The following additional instruction applies:

(i) If the regulation requirements specify a percentage of the LFG that is required to be flared, the amount shall equal fy.;

(ii) If the regulation requirements do not specify the amount or percentage of LFG that should be destroyed but require the installation of a capture system, without requiring the captured LFG to be flared then fy = 0; and

(iii) If the requirement do not specify any amount or percentage of LFG that should be destroyed but require the installation of a system to capture and flare the LFG, then it is assumed fy = 0.2.6

$$BE_y = \sum_t \left(BE_{CH4,t,y} + BE_{WW,y} + BE_{EN,t,y} + BE_{NG,t,y}\right) \times DF_{RATE,t,y} \qquad \text{Equation (1)}$$

With:

$$DF_{RATE,t,y} = \begin{cases} 1 - RATE_{compliance,t,y}, & if\ RATE_{compliance,t,y} < 0.5 \\ 0, & if\ RATE_{compliance,t,y} \geq 0.5 \end{cases} \qquad \text{Equation (2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2e)
$BE_{CH4,t,y}$	=	Baseline emissions of methane from the SWDS in year *y* (t CO_2e)
$BE_{WW,y}$	=	Baseline methane emissions from anaerobic treatment of the wastewater in open anaerobic lagoons or of sludge in sludge pits in the absence of the project activity in year *y* (t CO_2e)
$BE_{EN,t,y}$	=	Baseline emissions associated with energy generation in year *y* (t CO_2)
$BE_{NG,t,y}$	=	Baseline emissions associated with natural gas use in year *y* (t CO_2)
$DF_{RATE,t,y}$	=	Discount factor to account for $RATE_{Compliance,t,y}$
$RATE_{compliance,t,y}$	=	Rate of compliance of a requirement that mandates the use of alternative waste treatment option *t* in year *y*
t	=	Type of alternative waste treatment option

For simplification, the type of alternative waste treatment option *t* is hitherto omitted.

Procedure (D): Baseline emissions associated with natural gas use (BENG,y)

$BE_{NG,y}$ is estimated as follows:

$BE_{NG,y} = BIOGAS_{NG,y} \times NCVBIOGAS_{,NG,y} \times EFCO2_{,NG,y}$ Equation (17)

Where:

$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year y (t CO2)

$BIOGAS_{NG,y}$ = Quantity upgraded biogas sent to the natural gas network due to the project activity in year y (Nm3)

$NCVBIOGAS_{,NG,y}$ = Net calorific value of the upgraded biogas sent to the natural gas network due to the project activity in year y (TJ/Nm3)

$EFCO2_{,NG,y}$ = Average CO2 emission factor of natural gas in the natural gas network in year y (t CO2/TJ)

$EFCO2_{,NG,y}$ is determined using the relevant provisions in the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

3.2 Project Emissions

The project emission calculation as per para 65 of of ACM0022 version 02,

The project emissions in year *y* are calculated for each alternative waste treatment option implemented in the project activity as follows:

$$PE_y = PE_{COMP,y} + PE_{AD,y} + PE_{GAS,y} + PE_{RDF\_SB,y} + PE_{INC,y} \quad \text{Equation (18)}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2e)
$PE_{COMP,y}$	=	Project emissions from composting or co-composting in year *y* (t CO_2e)
$PE_{AD,y}$	=	Project emissions from anaerobic digestion and biogas combustion in year *y* (t CO_2e)
$PE_{GAS,y}$	=	Project emissions from gasification in year *y* (t CO_2e)
$PE_{RDF\_SB,y}$	=	Project emissions associated with RDF/SB in year *y* (t CO_2e)
$PE_{INC,y}$	=	Project emissions from incineration in year *y* (t CO_2e)

Project emissions from electricity use (PEEC,t,y)

The project emissions from electricity consumption due to waste treatment process t implemented under the project activity (PEEC,t,y) shall be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". When applying the tool:

(a) Project emissions shall be calculated for the sources of electricity consumed due to the alternative waste treatment process t, excluding consumption of electricity that was generated by the project activity (ECt,y); (b) If the project activity consists of more than one alternative waste treatment process, then project participants may choose to monitor electricity consumption for the

entire site and then allocate this consumption to one of the different alternative waste treatment processes (e.g. apportionment based on sub-metering data is not required).

3.3 Leakage

As per para 96 of ACM0022 version 02,

Leakage emissions are associated with composting/co-composting, anaerobic digestion and the use of RDF/SB that is exported outside the project boundary. For the case that waste by-products of the alternative waste treatment option are:

(a) Used for soil application, this emissions shall be neglected;

(b) Composted or co-composted, then these shall be treated as fresh waste with emissions estimated according to the procedure project emissions from composting (PECOMP,y).

3.4 Estimated Net GHG Emission Reductions and Removals

As per para 107 of ACM0022 version 02; Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e/yr)

BE_y = Baseline emissions in year *y* (t CO_2/yr)

PE_y = Project emissions in year *y* (t CO_2e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
Year 8				

Year 9				
Year 10				
Total				
Average				

4 MONITORING

4.1 Data and Parameters Available at Validation

To be provided at a later stage

Data / Parameter	
Data unit	*Indicate the unit of measure*
Description	*Provide a brief description of the data/parameter*
Source of data	*Indicate the source(s) of data*
Value applied:	*Provide the value applied*
Justification of choice of data or description of measurement methods and procedures applied	*Justify the choice of data source, providing references where applicable. Where values are based on measurement, include a description of the measurement methods and procedures applied (eg, what standards or protocols have been followed), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. More detailed information may be provided in an appendix.*
Purpose of Data	*Indicate one of the following:* • *Determination of baseline scenario (AFOLU projects only)* • *Calculation of baseline emissions* • *Calculation of project emissions* *Calculation of leakage*
Comments	*Provide any additional comments*

4.2 Data and Parameters Monitored

Data / Parameter	
Data unit	*Indicate the unit of measure*
Description	*Provide a brief description of the data/parameter*
Source of data	*Indicate the source(s) of data*
Description of measurement methods and procedures applied	*Specify the measurement methods and procedures, any standards or protocols followed, and the person/entity responsible for the measurement. Include any relevant information regarding the accuracy of the measurements (eg, accuracy associated with meter equipment or laboratory tests).*
Frequency of	*Specify measurement and recording frequency*

monitoring/recording	
Value applied:	*Provide an estimated value for the data/parameter*
Monitoring equipment	*Identify equipment used to monitor the data/parameter including type, accuracy class, and serial number of equipment, as appropriate.*
QA/QC procedures applied	*Describe the quality assurance and quality control (QA/QC) procedures applied, including the calibration procedures where applicable.*
Purpose of data	*Indicate one of the following:* • *Calculation of baseline emissions* • *Calculation of project emissions* *Calculation of leakage*
Calculation method	*Where relevant, provide the calculation method, including any equations, used to establish the data/parameter.*
Comments	*Provide any additional comments*

4.3 Monitoring Plan

Describe the process and schedule for obtaining, recording, compiling and analyzing the monitored data and parameters set out in Section 4.2 (Data and Parameters Monitored) above. Include details on the following:

- *The methods used for generating/measuring, recording, storing, aggregating, collating and reporting data and parameters. Where relevant, include the procedures for calibrating monitoring equipment.*
- *The organizational structure, responsibilities and competencies of the personnel that carried out monitoring activities.*
- *The policies used for oversight and accountability of monitoring activities.*
- *The procedures used for internal auditing and QA/QC.*
- *The procedures used for handling any internal auditing performed and any non- conformances identified.*
- *The implementation of sampling approaches, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement and QA/QC procedures. Where applicable, demonstrate whether the required confidence level or precision has been met.*

Where appropriate, include line diagrams to display the GHG data collection and management system.

The Monitoring for the project shall be described at a later stage.

5 SAFEGUARDS

5.1 No Net Harm

There were no harm identified form the project and hence no mitigations measures are applicable.

5.2 Environmental Impact

The proposed project activity is Waste to energy generation which is free from any kind of anthropogenic emission. Project activity is not having any negative environmental impacts. These projects rather help having a positive impact on the environment as it leads to efficient management waste.

5.3 Local Stakeholder Consultation

The Local Stakeholder Meetings were organized at the project sites.

The following are the stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors
- Local Municipal bodies

The Minutes of LSH meeting along with List of Attendees and other supporting's shall be submitted to the DOE.

5.4 Public Comments

The project shall be listed at the VCS website and the comments if received shall be addressed.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

To be described at a later stage.

Data / Parameter	
Data unit	*Indicate the unit of measure*
Description	*Provide a brief description of the data/parameter*
Value applied:	*Provide the monitored value for the data/parameter*
Comments	*Provide any additional comments*

6.2 Baseline Emissions

To be described at a later stage

6.3 Project Emissions

To be described at a later stage

6.4 Leakage

To be described at a later stage

6.5 Net GHG Emission Reductions and Removals

To be described at a later stage

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year A				
Year...				
Total				

APPENDIX X: <TITLE OF APPENDIX>

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.