



Verified Carbon Standard

7.5 MW WASTE-TO-ENERGY POWER PLANT BY GOODWATTS WTE JAMNAGAR PRIVATE LIMITED IN GUJARAT, INDIA



Document Prepared by
Kosher Climate India Private Limited
carbon@kosherclimate.com

Project Title	7.5 MW Waste-to-Energy Power Plant by Goodwatts WTE Jamnagar Private Limited in Gujarat,India
Version	05
Date of Issue	02-August-2024
Prepared By	Kosher Climate India Private Limited
Contact	Zee Plaza, No.1678, Ground and 1st Floor, 27th Main Rd, HSR Layout, Sector 2 Bengaluru, Karnataka 560102, India Email: vamsi@kosherclimate.com ; narendra@kosherclimate.com ; https://kosherclimate.com/

CONTENTS

- 1 PROJECT DETAILS..... 4**
 - 1.1 Summary Description of the Project 4
 - 1.2 Sectoral Scope and Project Type 5
 - 1.3 Project Eligibility 5
 - 1.4 Project Design 5
 - 1.5 Project Proponent 6
 - 1.6 Other Entities Involved in the Project 7
 - 1.7 Ownership..... 7
 - 1.8 Project Start Date 7
 - 1.9 Project Crediting Period 7
 - 1.10 Project Scale and Estimated GHG Emission Reductions or Removals 8
 - 1.11 Description of the Project Activity 8
 - 1.12 Project Location 11
 - 1.13 Conditions Prior to Project Initiation 12
 - 1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks 12
 - 1.15 Participation under Other GHG Programs 12
 - 1.16 Other Forms of Credit..... 14
 - 1.17 Sustainable Development Contributions 15
 - 1.18 Additional Information Relevant to the Project 17

- 2 SAFEGUARDS 18**
 - 2.1 No Net Harm 18
 - 2.2 Local Stakeholder Consultation 18
 - 2.3 Environmental Impact 20
 - 2.4 Public Comments 22
 - 2.5 AFOLU-Specific Safeguards 22

- 3 APPLICATION OF METHODOLOGY..... 22**
 - 3.1 Title and Reference of Methodology 22
 - 3.2 Applicability of Methodology 23
 - 3.3 Project Boundary 32
 - 3.4 Baseline Scenario 34

3.5	Additionality	34
3.6	Methodology Deviations	42
4	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	42
4.1	Baseline Emissions	42
4.2	Project Emissions	49
4.3	Leakage.....	53
4.4	Net GHG Emission Reductions and Removals.....	53
5	MONITORING	54
5.1	Data and Parameters Available at Validation	54
5.2	Data and Parameters Monitored.....	67
5.3	Monitoring Plan.....	80
	APPENDIX	83

1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity is 7.5MW Waste to Energy Power Plant located at Jamnagar City in Gujarat, India. The plant utilizes the Refuse-Derived Fuel (RDF) as feedstock derived from the separation and sorting of Municipal Solid Waste (MSW) excluding the recyclable or potentially hazardous materials from the waste stream. The MSW is sourced from the Jamnagar City as per concession agreement with Jamnagar Municipal Corporation. M/s GoodWatts WTE Jamnagar Private Limited (GWJPL) includes the construction and operation of RDF based waste to energy plant. This project is SPV (a special purpose vehicle) of Abellon CleanEnergy Ltd. based in Ahmedabad, Gujarat, India and Jamnagar Municipal Corporation (JMC).

The main purpose of this project activity is to generate clean form of electricity through waste to energy-based power generation. The project will utilise about 311 ton of RDF per day and generate electricity with the installed capacity of 7.5 MW. The waste to energy plant will use 1 travelling grate-type boiler for treating RDF and a combination of 1 steam turbines and 1 generator to recover heat from combustion of RDF for generating electricity. Generated electricity is supplied to the national grid through contractual agreement with the DISCOM. The project is located in Navagam Ghed, Jamnagar, Gujarat state of India.

Scenario existing prior to the implementation of project activity:

This is a greenfield project activity. Prior to the implementation of the project activity, MSW in Jamnagar city was mainly subjected to landfill in anaerobic condition without any methane recovery system for flaring or energy recovery purpose, therefore in the absence of the project activity, methane emissions from anaerobic decay of waste would have been released into the atmosphere.

For electricity component, prior to the implementation of the project activity, the electricity supply for Jamnagar city was generated mainly from grid connected power plants.

The project activity helps to avoid methane emissions from open dump site in the absence of the project activity and generate renewable electricity, which displaced part of the electricity otherwise supplied by grid connected power plants. The project is expected to achieve an annual average emission reduction of 39,774 tCO₂e over the 7-year crediting period and a total emission reduction of 278,421 tCO₂e during the first 7-year renewable crediting period.

Audit Type	Period	Program	VVB Name	Number of years
Validation	13-November-2023	VCS	LGAI Technological Center, S. A	07

1.2 Sectoral Scope and Project Type

The types/categories of the project are classified as follow:

Waste treatment component:

Type III: Other project activities
 Sectoral Scope 13: Waste handling and disposal

Switch of fossil fuel component:

Type I: Renewable energy projects
 Sectoral Scope 1: Energy industries (renewable/non-renewable sources)

This is not a grouped project and there are no other project participants.

1.3 Project Eligibility

The project activity results in GHG emission reductions included in six Kyoto Protocol greenhouse gases, which are listed under the scope of the VCS Program according to VCS Standard version 4.5.1. The scope of VCS programme includes

The Seven Kyoto Protocol Greenhouse gases	The project is expected to avoid two greenhouse gases ² : i. Methane (CH ₄) emissions from the municipal solid waste (MSW) disposal site in the baseline scenario, which will be destroyed in the project scenario. ii. CO ₂ emissions from the production of equivalent amount of electricity replaced by the project that would otherwise have been produced by grid connected power plants. Thus, the project is applicable to this scope.
Ozone-depleting substances (ODS)	Not applicable, CH ₄ and CO ₂ are not Ozone-depleting substances.
Project activities supported by a methodology approved under the VCS Program through the methodology development and review process.	Not applicable

¹ <https://verra.org/wp-content/uploads/2023/08/VCS-Standard-v4.5-updated-4-Oct-2023.pdf>

² https://unfccc.int/sites/default/files/08_unfccc_kp_ref_manual.pdf

Project activities supported by a methodology approved under an approved GHG program, unless explicitly exclude.	The applied methodology “AMS-III.E. and AMS-I.D.”, are approved under CDM Program, which is a VCS approved GHG program.
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	Not applicable

The project uses AMS-III.E. “Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment”, ver. 17.0 and AMS-I.D. “Grid connected renewable electricity generation”, ver. 18.0. The methodology AMS-III.E. applies to project activities involving the prevention of decay of the wastes through controlled combustion; or gasification to produce syngas/producer gas; or mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB) and the methodology AMS-I.D. applies to project activities that comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass, that is supplying electricity to a national or a regional grid.

Since AMS-III.E and AMS-I. D are approved methodology under an approved GHG program, the project is eligible under the scope of the VCS Program according to VCS Standard, version 4.5.

Furthermore, the project activity is not included in any of the excluded project activities, those listed under the Table 1 of VCS Standard, version 4.5.

Hence the project activity is eligible to register under the VCS program standard, version 4.5.

1.4 Project Design

- The project includes a single location or installation only
- The project includes multiple locations or project activity instances, but is not being developed as a grouped project
- The project is a grouped project

Eligibility Criteria

This is single location project and not a grouped project.

1.5 Project Proponent

Organization name	Goodwatts WTE Jamnagar Private Limited
Contact person	Mr. Pankaj Patel

Title	President & Member of Board - Abellon
Address	10 th Floor, Sangeeta Complex, Nr. Parimal Crossing, Ellis bridge Ahmedabad – 380 006, GUJARAT, INDIA
Telephone	+91-79-66776100
Email	pankaj@abellon.com

1.6 Other Entities Involved in the Project

Organization name	Kosher Climate India Private Limited.
Contact person	Mr. Vamsi Krishna
Title	Managing Director
Address	Zee Plaza, No.1678, 27th Main Road, Sector 2, HSR Layout, Bengaluru, Karnataka 560102, India
Telephone	+91-99453 43475
Email	vamsi@kosherclimate.com

1.7 Ownership

GoodWatts WTE Jamnagar Pvt. Ltd. is a SPV of Abellon CleanEnergy Ltd. Abellon CleanEnergy Ltd. is the legal owner of Jamnagar Waste to Energy Plant (GoodWatts WTE Jamnagar Pvt. Ltd.). They have the legal right to control and operate the project activities.

The Concession Agreement, Power Purchase Agreement (PPA), land lease agreement and other documents are evidences for the ownership of the plant, equipment and process that generates GHG emission reductions.

1.8 Project Start Date

The start date of the project activity is the commercial operation date (COD), which is the date when the project began generating GHG emission reductions. The project started on 15-November- 2021, with the commissioning of the MSW processing facility, where the MSW was collected, processed to produce RDF and started generating electricity through combustion; therefore, the COD is considered the start date of the project activity.

1.9 Project Crediting Period

The VCS Standard 4.5³ states that the project crediting period for non-AFOLU projects shall be either seven years, twice renewable for a total of 21 years, or ten years fixed. Since this project is a non-AFOLU project, the renewable crediting period of 7 years, twice renewable for a total of 21 years is chosen by the Project Proponent (PP).

The project proponent has considered the project start date as the commissioning date of the project activity i.e. 15-November-2021.

Hence, the crediting period start date from 15-November-2021 with the length of first crediting period starting from 15-November-2021 to 14-November -2028.

1.10 Project Scale and Estimated GHG Emission Reductions or Removal

The estimated annual GHG emission reductions/removals of the project are:

- <20,000 tCO₂e/year
- 20,000 – 100,000 tCO₂e/year
- 100,001 – 1,000,000 tCO₂e/year
- >1,000,000 tCO₂e/year

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
15-November-2021 to 14-November-2022	8,878
15-November-2022 to 14-November-2023	26,847
15-November-2023 to 14-November-2024	36,641
15-November-2024 to 14-November-2025	44,052
15-November-2025 to 14-November-2026	49,776
15-November-2026 to 14-November-2027	54,293
15-November-2027 to 14-November-2028	57,933

³ <https://verra.org/wp-content/uploads/2023/08/VCS-Standard-v4.5-updated-4-Oct-2023.pdf>

Total estimated ERs	278,421
Total number of crediting years	07
Average annual ERs	39,774

1.11 Description of the Project Activity

The project activity involves travelling grate incineration technology to incinerate RDF prepared from MSW sourced from Jamnagar city that would otherwise be disposed of at a local landfill site. The main equipment in the project activity includes 1 incinerator, 1 boiler (40 tons per hour), 1 steam turbines and 1 generator (7.5 MW), the transformer station and electricity transmission line, exhaust gas cleaning systems and ash remove systems.

The fresh MSW received at the unloading bay is fed to the pre-processing section. The waste is subjected to the moving bed feeder for further process, which includes splitter, start screen, shredder. The shredded material is fed to the air density separator (ADS) and Over bend magnetic separator (OBMS) to remove the heavier particle like stone, metals etc. After pre-processing, the RDF is being moved to the waste feeding section. RDF is fed to the boiler by grabber through vibro feeder at the rate of 14 TPH. RDF is incinerated on travelling grate. The unburnt components continue to move on the grates to get out of the combustion chamber and fall into the slag collector of furnace bottom in form of bottom ash. The heat recovered from the incineration process will be provided to boilers. The superheated steam generated from the boilers will be fed into the steam turbine to generate kinetic energy. Turbines are connected to generators to produce electricity. The electricity generated from the project activity will be exported to the national grid through the electricity transmission line. The flue gases from the incineration process including NO_x, SO_x, HCl, and dioxin or furan if any will be treated by the flue gas cleaning technology. This includes combustion control, electrostatic precipitator, lime power dosing, activated carbon adsorption, bag filter. After the treated clean gas, which meets states and national Environmental Quality Standard will be release to the atmosphere from chimneys. The bottom ash and fly ash will be collected and sent to the brick manufactures.

The lifetime of the project activity is 25 years and the life of major equipment are provided in table below.

The layout of the plant is shown in below figure:

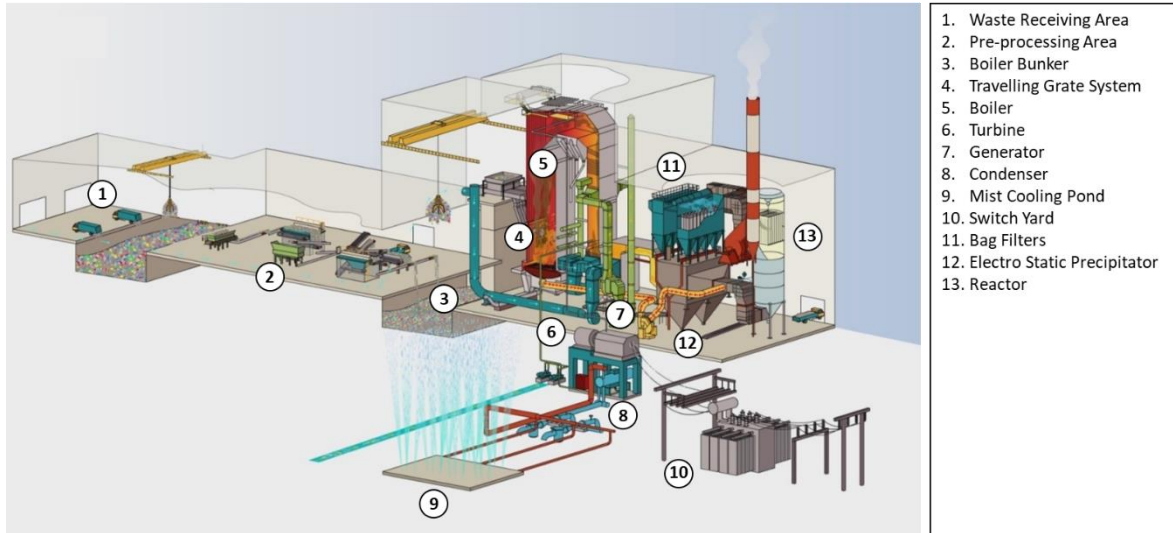


Figure 1: Plant Layout

The main technical details of Jamnagar Waste to Energy plant project are shown in table below:

Main Component	Indicator	Values
Incinerator/ Furnace	Type	Travelling Grate Type
	Manufacturer	Thermodyne Technology Pvt. Ltd. (TTPL)
	Number	1
	Unit capacity	400 ton/day
	Lifetime	25 years
Boiler	Number	1
	Manufacturer	Thermodyne Technology Pvt. Ltd. (TTPL)
	Unit steam output	40 ton/h
	Rated Outlet Steam Pressure	42 Kg/cm ² (G)
	Rated Steam Temperature	410 °C ± 10 °C
	Efficiency	85.9 %
	Lifetime	25 years
Steam turbine	Type	Condensing turbine (Bleed Cum)
	Manufacturer	Triveni Turbine Ltd.
	Number	1
	Rated capacity	7.5 MW
	Speed	7611 rpm
	Input steam	40 BAR (A) – 400°C
	Lifetime	25 years
Generator	Number	1
	Capacity	7.5 MW

	Manufacturer	TD Power Systems Limited.
	Frequency	50 Hz
	Rated voltage	11 kV
	Lifetime	25 years

1.12 Project Location

The Project is located in, Navagam Ghed, Jamnagar 361008, Gujarat, India. The geo-coordinate of the project is 22° 29'44.83"N, 70° 4'0.43"E. The location map is given below.

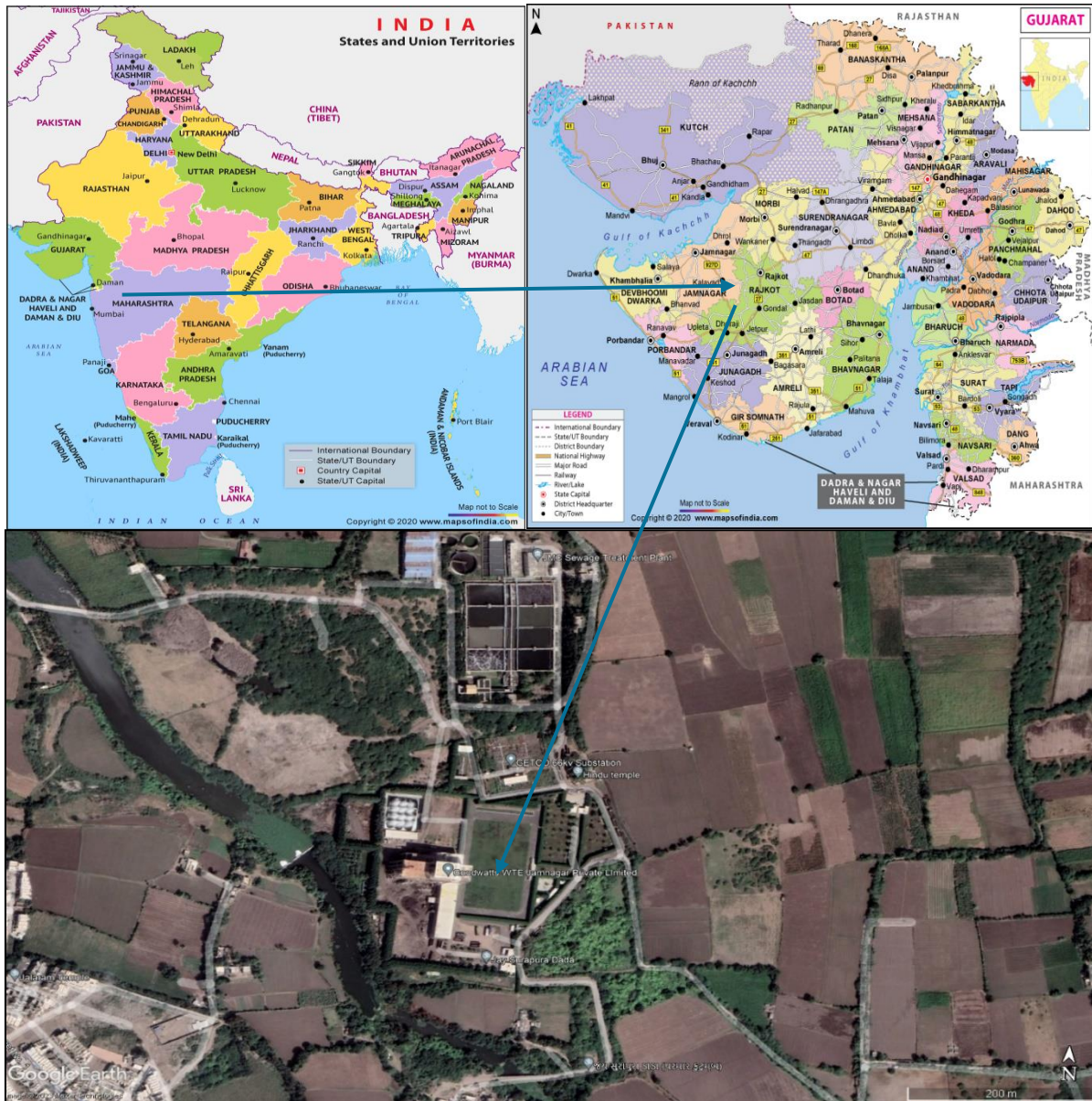


Figure 2: Location of the Project site

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is:

Waste Treatment:

In the absence of the project activity, the municipal solid waste generated in Jamnagar city were subjected to landfill, where the waste was left to decay in anaerobic conditions. The greenhouse gases (GHG) generated from the solid waste were released directly into atmosphere.

Electricity Generation:

In the absence of the project activity, the electricity supply for Jamnagar city was generated mainly from grid connected power plants, where the use of fossil fuel would also lead to GHG emissions.

The baseline scenario is the same as the scenario existing prior to the start of the implementation of the project activity. Please refer to Section 3.4 (Baseline Scenario) for details.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment, Forest & Climate Change (MOEF&CC), Government of India (As per MOEF&CC Notification No. - S.O. 1533, dated 14th September 2006⁴). In addition to that, all applicable laws and regulations in India were complied with.

The Consent to Establish (CTE) and Consent to Operate (CTO) are obtained from the state Pollution Control Board under Air (Prevention and Control of Pollution Act, 1981⁵ and Water (Prevention and Control of Pollution) Act 1974⁶.

The project activity is implemented in compliance to The Factories Act, 1948⁷ & The Indian Boilers Act-1923⁸.

The project is in compliance with the Municipal Solid Waste (Management and Handling) Rules 2000⁹, where all the municipal authorities in country are directed to manage solid waste in their respective jurisdiction. The central government has revised and replaced the MSW Rules 2000

⁴ https://environmentclearance.nic.in/writereaddata/EIA_Notifications/1_SO1533E_14092006.pdf

⁵ <https://cpcb.nic.in/displaypdf.php?id=aG9tZS9haXltcG9sbHV0aW9uL0dTU02RS5wZGY=>

⁶ https://maitri.mahaonline.gov.in/pdf/The_Water_Prevention_and_Control_of_Pollution_Act_1974.pdf

⁷ https://environmentclearance.nic.in/report/EIA_Notifications.aspx

⁸ <https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/48110/114241/F-1729379182/IND48110.pdf>

⁹ https://cpcb.nic.in/uploads/MSW/MSW_AnnualReport_2001-02.pdf

with Solid Waste Management (SWM) Rules 2016¹⁰. The new rules are applicable beyond municipal areas and include urban agglomerations, census towns, notified industrial townships, areas under the control of Indian Railways, airports, special economic zones, places of pilgrimage, religious and historical importance, and State and Central Government organisations in their ambit. The key areas covered under these rules are segregation at source, collection & Disposal of sanitary waste, collect back mechanism for packaging waste, user fee for collection, waste processing and treatment, promotion of compost, promotion of waste to energy, revision of parameters and standards etc. The project activity is in compliance with the National Urban Sanitation Policy, 2008¹¹, that has the goal to transform Urban India into community-driven, totally sanitized, healthy and liveable cities and towns. The project activity is in compliance with the plastic waste management rules, 2016¹².

The Swachh Bharat Mission or Clean India Mission, 2014 was launched to eliminate the open defecation, eradication of manual scavenging, modern and scientific municipal solid waste management. In addition, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) launched in 2015¹³ focuses on development of basic infrastructure, in the cities and towns, in the sectors of water supply, sewerage and septage management, storm water drainage, green spaces and parks, and non-motorized urban transport. The project is in compliance with the Swachh Bharat Mission and AMRUT.

The project activity is implemented in compliance with the Gujarat Waste to Energy Policy, 2016¹⁴.

The project activity has obtained approval from Gujarat Energy Development Agency (GEDA) to set up the Municipal Solid Waste based Power Project.

The project activity is in compliance with all relevant statutory and regulatory laws applicable in the host country.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity is neither registered nor applied for registration in other GHG or Non GHG program(s) to obtain the certified GHG emission reductions. Project proponent is here by declaring that the emission reductions claimed under this project activity will not be double counted under any other GHG program.

¹⁰ https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

¹¹ https://www.mohua.gov.in/upload/uploadfiles/files/NUSP_0.pdf

¹² <https://thc.nic.in/Central%20Governmental%20Rules/Plastic%20Waste%20Management%20Rules,%202016.pdf>

¹³ <https://pib.gov.in/PressReleasePage.aspx?PRID=1885837>

¹⁴ <https://faolex.fao.org/docs/pdf/IND169749.pdf>

1.15.2 Projects Rejected by Other GHG Programs

The project activity is neither registered nor rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

Yes No

If yes, provide the name of the emissions trading program or other mechanism that allows GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

Yes No

If yes, provide the name of the other program(s) under which the project has sought or received another form of GHG-related credit.

Supply Chain (Scope 3) Emissions

Have the owner(s) or retailer(s) of the impacted goods and services¹⁵ posted a public statement saying, “VCUs may be issued for the greenhouse gas emission reductions and removals associated with [organization name(s)] [name of good or service]” since the project’s start date?

Yes No

Has the project proponent posted a public statement saying, “VCUs may be issued for the greenhouse gas emission reductions and removals associated with [name of good or service] [describe the region or location, including organization name(s), where practicable].”

Yes No

Have the producer(s) or retailer(s) of the impacted good or service been notified of the project and the potential risk of Scope 3 emissions double claiming via email?

¹⁵ Impacted goods and services are all goods and services directly impacted by the technologies and measures specified as project activities in the project description. Please see the VCS Program document *VCS Program Definitions* for additional information.

Yes

 No

As per the Corporate Value Chain (Scope 3) Accounting and Reporting Standard¹⁶, the project activity does not involve any direct impact emissions associated with good or services. The project activity is not related with scope 3 emissions. Hence this section is not applicable to the project activity.

1.17 Sustainable Development Contributions

This plant operation directly covers key areas of sustainable development including renewable power generation, solid waste management, wastewater management and efficient usage, environment protection, innovative technological integrations, and partnership for sustained growth. Moreover, the design and infrastructure development for this 7.5 MW WTE campus also incorporated green building attributes to enhance overall sustainability of the system. With reference to the above mentioned all parameters; the MSW based waste to energy plant has incorporated many of the Sustainable Development Goals (SDGs) of United Nations.

Among 17 SDGs, 09 SDGs are directly linked with the design of the campus and process innovation of this MSW to renewable energy production facility:

1. Clean water and sanitation (SDG-6)

Goal: Ensure availability and sustainable management of water and sanitation for all

Target: 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

Indicator: 6.3.1 Proportion of domestic and industrial wastewater flows safely treated

By efficient reuse of around 1-million-liter city's treated leftover sewage wastewater per day in power operations. Since the plant commissioning the treated water is used for the project activity.

Monitoring Parameter: Net Inlet Quantity of sewage treated water per day (m³/day)

2. Affordable and clean energy (SDG-7)

Goal: Ensure access to affordable, reliable, sustainable and modern energy for all

Target: 7.2: By 2030 increase substantially the share of renewable energy in the global energy mix

Indicator: 7.2.1: Renewable energy share in the total final energy consumption

By generating 7.5MW renewable power. To calculate the carbon emission that would have otherwise generated from fossil fuel energy generation and also to substantiate SDG 7.

Net quantity of renewable energy generated from the power plant, which otherwise would have been generated from the grid connected power plants.

¹⁶ https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf

Monitoring Parameter: Net Electricity Generation (GWh/year)

3. Decent work & economic growth (SDG-8)

Goal: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Target: 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

Indicator: 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities

The project activity provides employment opportunities and the average salaries has been paid to employees irrespective of sex, age group, etc which leads to increased productivity, driving economic development. By additional revenue generation from municipal waste, post combustion ash and recovering valuable metals and non- metals from the waste.

Monitoring Parameter: No of employment (with bifurcation on number by sex, age group and where applicable, persons with disabilities), Average earnings, Policy for Non-discrimination and equal pay for the work of equal value.

4. Industry innovation and infrastructure (SDG-9)

Goal: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Target: 9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

Indicator: 9.b.1 Proportion of medium and high-tech industry value added in total value added

By integration of advance patented technology in the project activity. The project activity has obtained Indian Patent [Patent No. 201621023135].

The project has been rated and pre-certified with 'Platinum Rating' as green campus by Indian Green Building council (IGBC).

5. Sustainable cities and communities (SDG-11)

Goal: Make cities and human settlements inclusive, safe, resilient and sustainable

Target: 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Indicator: 11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities

Monitoring Parameter: Net Inlet Quantity of Municipal Solid Waste (Tonnes per day)

6. Responsible consumption and production (SDG-12)

Goal: Ensure sustainable consumption and production patterns

Target: 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

By adopting material conservation and waste recycling approaches in plant design and operations. Recovery of metal and non-metal waste from MSW for re-using to boost circular economy.

Monitoring Parameter: Net Inlet Quantity of Municipal Solid Waste (Tonnes per day), Quantity of scrap metal recovered (Tonnes per day)

7. Climate action (SDG-13)

Goal: Take urgent action to combat climate change and its impacts

Target: 13.2 Integrate climate change measures into national policies, strategies and planning

Indicator: 13.2.2 Total greenhouse gas emissions per year

Reduction of annual average of 39,774 tons of CO₂ eq. greenhouse gas (GHG) emissions per year by coal replacement and avoiding open dumping of waste.

Project activity generates renewable energy-based electricity and mitigates the CO₂ emissions which would have been generated from the grid-connected power plants. Project has already commissioned and started reducing the emissions. Hence, complied to the SDG 13

Monitoring Parameter: GHG emission reductions (tCO₂/year)

8. Life on land (SDG-15)

Goal: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

By significant efforts in enhancing biodiversity by more than 10,000 tree plantations in campus (landscaping in 48% area of total campus) and conserving water biodiversity by diverting city leftover water-based pollution in local surface water streams.

9. Partnership for the goals (SDG-17)

Goal: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Target: 17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

By setting up of WTE plant in PPP (Public-Private Partnership) between GWJPL (Goodwatts WTE Jamnagar Pvt. Ltd) and JMC (Jamnagar Municipal Corporation).

1.18 Additional Information Relevant to the Project

Leakage Management

Not Applicable.

Commercially Sensitive Information

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

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project activity is generation of electricity by combustion of RDF, which is produced by treatment of municipal solid waste. This is a green technology which replaces the conventional fuel-source and results in greenhouse gas emission reduction. The project activity contributes to a significant higher ecological sustainability by treating the municipal solid waste.

There is no major risks or negative impacts associated with the operation of the project activity. Since the project is situated away from the vicinity of the inhabitants, there is no direct risk involving the inhabitants due to the project activity. The project owner ensures that safety training and hands-on training are conducted for the workers, engineers, contractors etc, involved in the project on-site daily. The grievance addressal register is made available to the local stakeholders all the time to register their grievances or complains if any due to the operation of the project activity.

Hence, the project has no negative environmental and socio-economic impacts and contributes positively by providing environment friendly power generation leading to sustainable development of the region.

2.2 Local Stakeholder Consultation

The scope of Local Stakeholder Consultation (LSC) meeting is to provide an opportunity to engage stakeholders in a meaningful manner at an early stage of the project activity which helps them to understand the project, participate in decision-making and exchange views and/or concerns regarding the project impacts and opportunities. This also enables or helps the project owner to identify, avoid and minimize adverse impacts and establish ongoing communications with relevant stakeholders during the lifetime of the project activity. The meeting provides an opportunity to inform local stakeholders about the waste-to-energy project, including its objectives, technology, environmental and health considerations, and potential benefits and drawbacks. Engaging the community can lead to a sense of ownership and collaboration in shaping the project's outcomes. The LSC meeting is intended to create a transparent, inclusive, and collaborative process that addresses concerns, maximizes benefits, and ensures that the project aligns with the needs and values of the local community.

Since the local communities are the predominant stakeholders for the meeting, sending individual invitations is not a possible option. So, the local people were invited through the public

notice which is more appropriate. The demographic information of the participants was received during the registration for the meeting

The Local stakeholder consultation meeting was conducted on 09-May-2023 in the project location, which is located in Navagam Ghed, Jamnagar city of Gujarat state, India. The LSC meeting was arranged by considering the VCS rules and requirements.

Minutes of the meeting

The project representative welcomed all the panel members and provided the technical description of the waste to energy plant including environmental, social and economic impacts on the local community. He described the operational flow of the project activity starting from the waste reception and preparation, pre-processing of waste, electricity generation, residue management, environmental compliance and concluded with the sustainability views of the project activity. Further, he explained the role of this waste management project over the years in addressing community development and livelihood issues and its contribution towards promoting sustainable development by linking local priorities to global challenges.

He explained how the WTE plants were contributing to the global warming and provided a comparison between baseline scenario and the project scenario to the stakeholders, where it was shown how a WTE plant is beneficial for the environment. Further, he briefed the stakeholders about the precautionary and safety measures to be kept in mind while working or visiting the plant. He explained the benefits of WTE plant and its contribution to waste management and climate mitigation. Further, he briefed the stakeholders about the UN Sustainable Development Goals and how this project was contributing towards the UN SDGs.

The feedback questionnaire was distributed to the stakeholders to collect the comments and concerns about the project activity. The following questions were asked in the questionnaire.

- Are you aware of this project activity?
- Does the construction and operation of the project provide the contribution to local employment?
- Does the project activity generate any kind of hazardous waste affecting the local premises?
- Does the project construction impact the quality of soil or soil erosion?
- Does the project construction impact the quality and quantity of ground water?
- Does the project construction and operation cause air pollution?
- Does the project operation cause noise pollution?
- Does the project construction have any negative impact on local population or animal or plant species?
- Does the project developer contribute any social development activities to the local community?
- Are you aware of the carbon credit program and carbon revenue?
- What do you like about the project?

- What do you don't like about the project?

This was followed by questions and experience sharing from the participating stakeholders. After listening to all the stakeholder comments, suggestions and answering their queries successfully, the meeting reached a closure and thanked everyone for being part of the stakeholder consultation meeting and requested everyone to keep up the momentum towards tackling climate change.

There were no concerns raised by the local stakeholders. The potential benefits of the project activity for the local stakeholders were acknowledged.

No negative comments have been received on project activity from any of the local stakeholders consulted. As all comments were very positive about the project, no further action is required. There were no further comments raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region.

Project owner has requested the stakeholders to contact the site in-charge any time through the email or phone or to the site address mentioned in the invitation to express their grievances in future. Also assured that a grievance register is always made available at the project site to register their complaints if any in the register and same will be addressed and resolved in the earliest possible time. The meeting list of stakeholders and photographs are provided in the Appendix No- 1.

2.3 Environmental Impact

The possible environmental impacts of the project and responding measurements taken by the project owner are summarized as follows:

Impacts and mitigation measures in the construction phase:

Dust and exhaust gases, noise:

Dust, exhaust gases and noise generated from vehicles for transportation of materials, machines, equipment and construction equipment, or ground leveling activities. However, these emissions are short term and localized at the project area. The mitigation measures had been conducted to minimize any potential native impacts as follow:

- Requested the contractors to implement environmental protection measures as well as supervise their compliance.
- Using advanced vehicles, machines and equipment, meeting the state standard on technical and environmental safety. They also had to be maintained periodically.
- Avoiding transportation of excess regulated weight; covering materials on transportation equipment when incoming or going out of the project site.
- Arranging operation time of vehicles and construction suitably, avoiding gather materials at the same time. Avoid construction activities during peak-hours.

- Covering and watering construction areas, to prevent from dispersion of dust into the ambient environment.
- Provide labour protection equipment such as safety masks, safety helmets, and protective clothes for workers.

Wastewater

To mitigate the impacts of wastewater, the following measures were conducted:

- Rainfall flew on construction site; it could contain excavated soil or waste. It shall be preliminarily deposited at pits before flowing into the drainage system.
- Prohibit washing equipment, machines at water sources or places from which washing water can directly flow into the drainage system of the area.
- Construction wastewater from washing area, mixing materials mainly contained suspended dust and may fall into and make blockage in the general drainage system. Therefore, mitigation measures were implemented to prevent from this like construction wastewater was led to pits before flow into the general drainage system.

Impacts and mitigation measures in the operation phase:

Gases emission

Gases emission from the transportation of MSW. These emissions will be managed and handled with the following measures:

- Trucks loading MSW must be covered to avoid dropping or emitting the bad odour of MSW.
- After moving MSW to waste bunkers, trucks will be washed before coming out of the plant.
- Periodically spaying deodorant chemical to minimize bad odour, bacteria.
- Planted around 10,000 trees around the plant to improve the microclimate.
- For flue gas, they will be treated in gas emission treatment system including, acid neutralization, dioxin and heavy metal removal by activated carbon, bag filters to extract dust from gas stream and chimney system. The continuous monitoring system will be installed to monitor main pollutants in flue gas (NO₂, SO₂, CO, HCl and dust) and treated gases emission need to meet the environmental quality standard before emitting into the atmosphere.

Wastewater

The wastewater from domestic activities (handled in septic tanks), leachates, washing of workshop and equipment will be led to the leachate treatment system and treated to meet the environmental quality standard before discharging to the receiver sources.

Solid waste

The solid waste will be gathered and moved to the waste reception area to be used as input waste of the plant.

2.4 Public Comments

The public comments received during the GSC period is provided below.

1. A great project turning non-recyclable waste into off-grid electricity replacing carbon emissions. There needs to be many more of these projects.

This is a positive comment. Hence acknowledged.

2. Is the project planning to opt for decarbonization, CCUS technology, also in lieu of the project getting its credit since 2021, does it want to transition the project from CDM to Article 6.4 Paris Agreement Mechanism as the credits gained through CDM shall get null and void the moment the implementation of registration of projects under transition begin after 31st December 2023.

The project activity is to generate electricity through municipal solid waste to energy plant. The auxiliary power required for the in-plant operations is utilised from the power generated by the project activity. The plant is completely carbon neutral, so further decarbonization is not required. The project activity predominantly focuses on methane avoidance from municipal solid waste through combustion and carbon dioxide avoidance from the grid. Hence, CCUS technology is inapplicable. The project is being developed under the Verified Carbon Standard (VCS) and is acquiring carbon credits through this mechanism. Hence, the transition of the project from CDM to Article 6.4 is inapplicable.

2.5 AFOLU-Specific Safeguards

This is a Non AFOLU project activity hence this is not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project uses two approved CDM small-scale methodologies

Type III, Other project activities:

AMS III.E “Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment”, Version 17.0.

Type I, Renewable Energy Projects:

AMS I.D, “Grid connected renewable electricity generation”, Version 18.0.

The methodology also refers to the latest approved version of the following tools:

- Tool 03- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, Version 03.0¹⁷
- Tool 04- Tool to calculate emissions from solid waste disposal sites, Version 08.1¹⁸
- Tool 07- Tool to calculate the emission factor for an electricity system, Version 07.0¹⁹
- Tool 12- Project and leakage emissions from transportation of freight, Version 01.1.0²⁰
- Tool 21- Demonstration of additionality of small-scale project activities, Version 13.1²¹
- Tool 27- Investment analysis, Version 12.0²²

3.2 Applicability of Methodology

The applicability criteria of the applied methodology are demonstrated below.

Title: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment Reference of methodology applied: AMS III.E, ver. 17.0		
S. No	Applicability conditions	Project Eligibility
1	The project activity does not recover or combust methane unlike AMS-III.G. Nevertheless, the location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.	The project activity involves methane avoidance through controlled combustion of municipal solid waste. There is no methane recovery involved. Before the implementation of the project activity, the municipal solid waste was disposed of at the Gulabnagar and Theba Waste Disposal sites, which were directed to specific deposition areas, creating stockpiles under anaerobic conditions with an approximate volume to surface area ratio of 1.56. Also, the waste disposal site included levelling of the waste which is considered

¹⁷ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf>

¹⁸ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.1.pdf>

¹⁹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

²⁰ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf>

²¹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf>

²² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v12.pdf>

		<p>as anaerobically managed solid waste disposal facilities, as the above-mentioned characteristics is consistent with the definition provided in tool 04, version 08.1.</p> <p>Hence the project activity meets the applicable condition.</p>
2	<p>If the project activity involves combustion, gasification or mechanical/thermal treatment of partially decayed waste mined (i.e., removed) from a solid waste disposal site in addition to freshly generated waste the project participants shall demonstrate that there is adequate capacity of the combustion, gasification or mechanical/thermal treatment facility to treat the newly generated wastes in addition to the partially decayed wastes removed from the disposal site. Alternately justifications for combusting, gasifying or mechanically/thermally treating the partially decayed wastes instead of the newly generated wastes shall be provided.</p>	<p>The project activity uses fresh waste sourced from Jamnagar Municipal Corporation and there is sufficient capacity available for the utilisation of waste to produce electricity. Hence the project activity meets the applicability condition.</p>
3	<p>If the combustion facility, the produced syngas, producer gas or RDF/SB is used for heat and electricity generation within the project boundary, that component of the project activity may use a corresponding methodology under Type I project activities.</p>	<p>The project activity involves utilisation of 311 TPD RDF and generation of electricity with the installed capacity of 7.5 MW. The electricity generated is supplied to the national grid. The relevant methodology AMS- I.D is applied to the project activity. Hence the condition is applicable to the project activity.</p>
4	<p>In case of RDF/SB production, project proponents shall provide evidence that no GHG emissions occur, other than biogenic CO₂, due to chemical reactions during the thermal treatment process for example limiting the temperature of thermal treatment to prevent the occurrence of pyrolysis and/or the stack gas analysis.</p>	<p>During incineration of MSW, GHG emissions such as nitrous oxide, methane is emitted in negligible amount due to its presence in waste. However, the project activity involves processing of MSW predominantly with organic content which is supported by waste characterization report. Hence, the project activity majorly</p>

		involves biogenic CO ₂ . Hence, the project meets the applicability condition.
5	In case of gasification, the process shall ensure that all the syngas produced, which may contain non-CO ₂ GHG, will be combusted and not released unburned to the atmosphere. Measures to avoid physical leakage of the syngas between the gasification and combustion sites shall also be adopted.	The project activity does not involve gasification process. Hence this condition is not applicable.
6	In case of RDF/SB processing, the produced RDF/SB should not be stored in such a manner as resulting in high moisture and low aeration favouring anaerobic decay. Project participants shall provide documentation showing that further handling and storage of the produced RDF/SB does not result in anaerobic conditions and do not lead to further absorption of moisture.	As per the plant design capacity, the project utilises about 311 ton of RDF per day and generate electricity with an installed capacity of 7.5 MW. The pre-processing section has sufficient design capacity to treat 600 TPD waste. Also, the boiler has a sufficient factory gate permissible limit to treat 311 TPD waste. As per the waste characterisation, out of 600 TPD waste, the processed RDF is 311 TPD remaining is the inert waste. Handling and storage of the collected RDF in the bunker does not undergo anaerobic condition as the continuous mixing of waste takes place to avoid moisture absorption and maintain homogeneity. In case of plant breakdown, the accumulated waste will be stored in enclosed bunker provided with adequate ventilation to promote aerobic conditions and the accumulated waste prior to current operation day will be scheduled for incineration to further avoid any anaerobic degradation. This ensures produced RDF/SB does not result in anaerobic conditions and do not lead to further absorption of moisture.
7	In case of RDF/SB processing, local regulations do not constrain the establishment of RDF/SB production	There are no local regulations that constrain the production/ utilisation of RDF. However, the project proponent has obtained necessary consent from State

	plants/thermal treatment plants nor the use of RDF/SB as fuel or raw material.	Pollution Control Board (SPCB) for the establishment of waste to energy plant. Hence this criterion is not applicable.
8	During the mechanical/thermal treatment to produce RDF/SB no chemical or other additives shall be used.	The RDF is produced from the municipal solid waste sourced from Jamnagar city. The waste is pre-processed to remove the unwanted/inert materials. During the mechanical treatment, no chemical or additives is used to produce RDF. Hence this criterion is not applicable.
9	In case residual waste from controlled combustion, gasification or mechanical/thermal is stored under anaerobic conditions and/or delivered to a landfill, emission from the residual waste shall to be taken into account using the first order decay model (FOD) described in AMS-III.G.	The residual waste from the controlled combustion process includes bottom ash and fly ash. Currently, the bottom ash and fly ash are disposed on daily basis to the brick manufacturers. The project facility has two silos for storing fly ash and shed for storing bottom ash. Therefore, it is not subjected to anaerobic storage. Hence this condition is not applicable.
Title: Grid connected renewable electricity generation Reference of methodology applied: AMS I.D, ver. 18.0		
1	This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	The project activity is a green field, Indian grid connected renewable waste to energy plant. Therefore, it confirms to the said criteria.
2	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir;	The project activity is installation of new grid connected waste to energy plant. Therefore, the said criterion is not applicable.

	<p>(b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m²;</p> <p>(c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m².</p>	
3	<p>If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.</p>	<p>The project activity is the installation of a new grid connected waste to energy plant. Hence this criterion is not applicable</p>
4	<p>Combined heat and power (co-generation) systems are not eligible under this category.</p>	<p>The project activity is the installation of a new grid connected waste to energy plant. Hence this criterion is not applicable</p>
5	<p>In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct¹ from the existing units.</p>	<p>The project activity is the installation of a new grid connected waste to energy plant. Hence this criterion is not applicable</p>
6	<p>In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.</p>	<p>The project activity is the installation of a new grid connected waste to energy plant. Hence this criterion is not applicable.</p>
7	<p>In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant</p>	<p>The project activity involves treatment of municipal waste generated from Jamnagar City to produce RDF (Refused Derived Fuel). The relevant methodology</p>

	Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	AMS-III. E. is used for the methane avoidance component through controlled combustion, gasification or mechanical/thermal treatment. There is no recovery of methane from waste. Hence this criterion is not applicable.
8	In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply.	The project activity involves treatment of municipal waste generated from Jamnagar City to produce RDF (Refused Derived Fuel). Hence this criterion is not applicable.
Title: Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion Tool 03, Version 03.0		
1.	This tool provides procedures to calculate project and/or leakage CO ₂ emissions from the combustion of fossil fuels. It can be used in cases where CO ₂ emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.	The project involves consumption of diesel for the operation of waste handling vehicle and loaders, and for the DG sets. Hence the project activity meets the applicable condition.
Title: Tool to calculate emissions from solid waste disposal sites Tool 04, Version 08.1		
1	The tool can be used to determine emissions for the following types of applications Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or combusting the methane (e.g., “ACM0001: Flaring or use of landfill gas”). The methane is generated from waste disposed in the past, including prior to the	The project activity involves treatment of municipal waste generated from Jamnagar City to produce RDF (Refused Derived Fuel). The methane emissions from waste disposed is avoided during the crediting period through controlled combustion of RDF. Hence the condition B is applicable to the project activity.

	<p>start of the CDM project activity. In these cases, the tool is only applied for an ex-ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g., measuring the amount of methane captured from the SWDS);</p> <p>Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. An example of this application of the tool is ACM0022, in which municipal solid waste (MSW) is treated with an alternative option, such as composting or anaerobic digestion, and is then prevented from being disposed of in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex-ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions.</p>	
<p>Title: Tool to calculate the emission factor for an electricity system Tool 07, Version 07.0</p>		
<p>1</p>	<p>This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g., demand-side energy efficiency projects).</p>	<p>The project activity is a greenfield waste to energy generation plant and hence, according to the applied methodology, the baseline scenario is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in “TOOL07: Tool to calculate the emission factor for an electricity system”.</p>

2	<p>Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e., option II a and option IIb. If option II a is chosen, the conditions specified in “Appendix 1: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.</p>	<p>Since the project activity is grid connected waste to energy project this condition is applicable.</p> <p>Combined margin grid emission factor has been calculated as per the CO₂ emission factor data base published by the CEA in which for the calculation of emission factor CEA have only considered grid connected plants.</p>
<p>Title: Project and leakage emissions from transportation of freight Tool 12, Version 01.1.0</p>		
1.	<p>This tool is applicable to project activities which involve freight transportation by road and where transportation is not the main project activity. This tool is not applicable to project activities where transportation is the main source of greenhouse gases emissions. This tool does not provide procedures to estimate baseline emissions from road transportation of freight. The tool only provides to determine CO₂ emissions. CH₄ and N₂O emissions are excluded for simplification as they are small compared to CO₂ emissions.</p>	<p>The project activity is a greenfield waste to energy generation plant. The project activity involves transportation of Municipal Solid Waste (MSW) from the waste collection point to the project site. The transportation of MSW is not the main project activity. Hence, this tool is applicable.</p>

2.	In addition, the tool is applicable for the determination of project or leakage emissions from freight transportation by rail in project activities where transportation is not the main project activity.	The project activity involves estimation of project emissions from transportation of freight by road. Hence this condition is not applicable.
Title: Demonstration of additionality of small-scale project activities Tool 21, Version 13.1		
1	The use of the methodological tool “Demonstration of additionality of small-scale project activities” is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board.	Since the applied technology is not a new methodology project proponent has applied this tool for the demonstration additionality in compliance with the tool. Hence this tool is applicable.
2	Project participants and coordinating/managing entities may also apply “TOOL19: Demonstration of additionality of microscale project activities” as applicable.	This is a small-scale project activity hence TOOL19: “Demonstration of additionality of microscale project activities” is not applicable.
Title: Investment analysis Tool 27, Version 12.0		
1	This methodological tool is applicable to project activities that apply the methodological tool “Tool for the demonstration and assessment of additionality”, the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality”, the guidelines “Non-binding best practice examples to demonstrate additionality for SSC project activities”, or baseline and monitoring methodologies that use the investment analysis for the demonstration of additionality and/or the identification of the baseline scenario.	The project activity applies “non-binding best practice examples to demonstrate additionality for SSC project activities”, Hence this tool is applicable.
2	In case the applied approved baseline and monitoring methodology contains requirements for the investment analysis	The project activity is a small-scale grid connected Waste to Energy power project. It refers to the “non-binding best practice

	that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.	examples to demonstrate additionality for SSC project activities”, Hence this tool is applicable.
--	---	---

3.3 Project Boundary

The project boundary defined as per the applied methodologies are:

(i) According to paragraph 21 of AMS-III.E, version 17.0

The project boundary are the physical, geographical sites:

- (a) Where the solid waste would have been disposed or is already deposited and the avoided methane emission occurs in absence of the project activity;
- (b) Where the treatment of biomass through controlled combustion, 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) And in the itineraries between them, where the transportation of wastes and combustion residues and/or residues of gasification and mechanical/thermal treatment process occurs.

As per the above-mentioned criteria, the project boundary includes the sites of waste collection, waste transportation from Jamnagar city to plant, the project site, transportation of inert waste to JMC landfill site and transportation of final combustion residues to the brick manufactures.

(ii) According to paragraph 18 of AMS-I. D, version 18.0

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The project activity involves the incineration of RDF prepared from MSW and exports electricity to the national grid. The project boundary includes the site of treatment process, on-site electricity and/or heat generation. The project boundary is shown in the figure below:

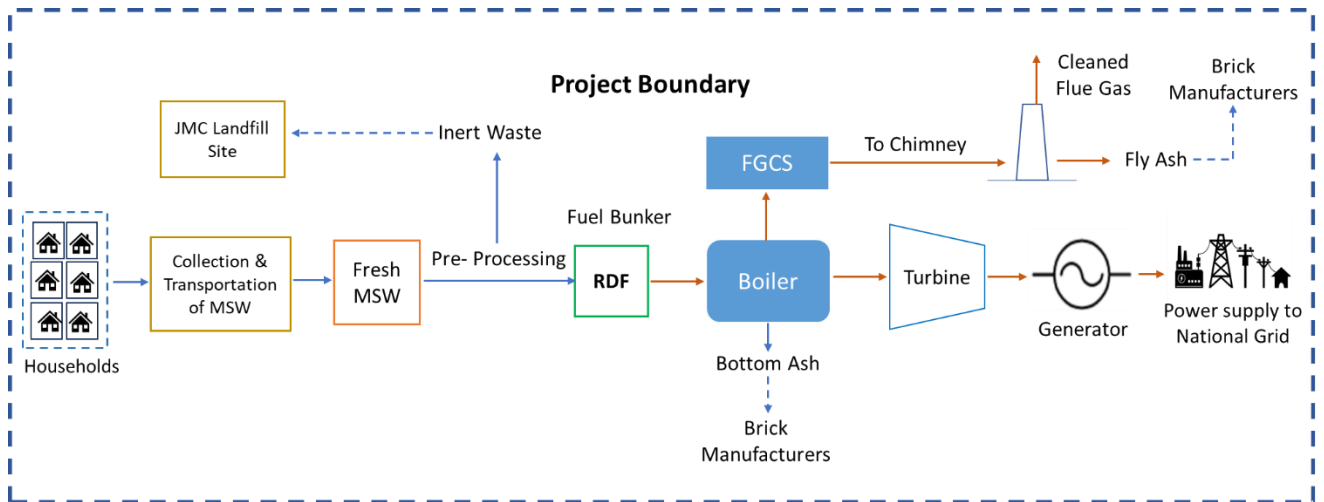


Figure 3: Project Boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Emissions from decomposition of waste at the SWDS	CO ₂	No	CO ₂ emissions from the decomposition of fresh waste are not accounted.
		CH ₄	Yes	The major source of emissions in the baseline.
		N ₂ O	No	N ₂ O emissions are small compared to CH ₄ emissions from landfills. Exclusion of this gas is conservative
	Emissions from electricity generation	CO ₂	Yes	Major source. Electricity generation emission is included in electricity grid-based emissions.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
Project	Emissions from on-site fossil fuel consumption due to the project activity	CO ₂	Yes	CO ₂ emission from fossil fuel consumption for the operation of the project activity.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
	Emissions from on-site electricity use	CO ₂	Yes	Electricity consumed for the operation of the project activity will be supplied from the Grid.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
		CO ₂	Yes	CO ₂ emission generated from combustion of RDF.

Source		Gas	Included?	Justification/Explanation
	Emission from the waste treatment processes	CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
	Emissions through incremental transportation	CO ₂	Yes	CO ₂ emission generated from incremental transportation.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.

3.4 Baseline Scenario

The baseline study was conducted using relevant methodology AMS-III.E, version 17.0 and AMS-I. D, version 18.0 as shown below:

As per para. 28 of AMS-III.E, the baseline scenario is the situation where, in the absence of the project activity, organic waste matter is left to decay within the project boundary and methane is emitted to the atmosphere. 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”.

Prior to the implementation of the project activity, MSW in Jamnagar city was mainly subjected to landfill in anaerobic condition without any methane recovery system for flaring or energy recovery purpose, therefore in the absence of the project activity, methane emissions from anaerobic decay of waste would have been released into the atmosphere.

As per para. 19 of AMS-I. D, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.²³

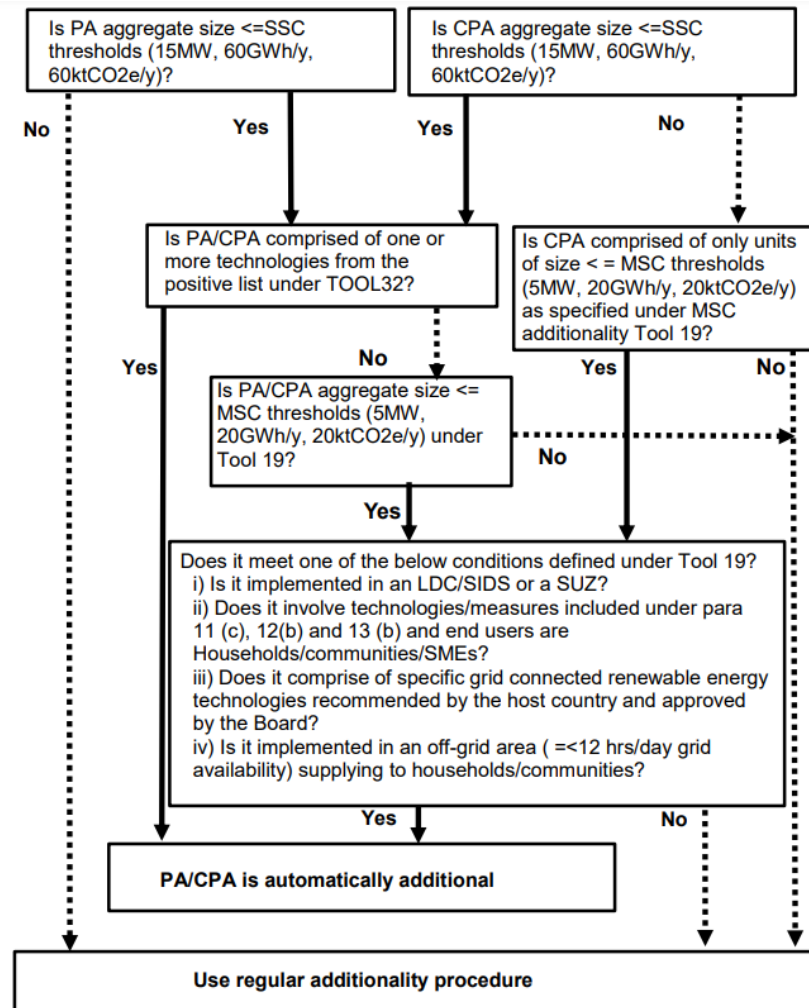
Prior to the implementation of the project activity, the electricity supply for Jamnagar city was generated mainly from grid connected power plants.

3.5 Additionality

The present VCS project generates power using waste to energy which is a renewable, zero emission source of energy. Baseline considerations for the project are based on approved consolidated baseline methodology AMS- III.E and AMS- I.D. The methodology requires the project investor to determine the additionality based on “Methodological Tool 21- Demonstration of

²³ https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Asia/India_Asia_RE_SP.pdf

additionality of small-scale project activities”, Version 13.1. The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:



Step 1: Is PA aggregate size <= SSC thresholds (15 MW, 60 GWh/y, 60 ktCO₂e/y)

The size of the project activity is less than 15MW and hence within the SSC thresholds.

Step 2: Is PA/CPA comprised of one or more technologies from the positive list under TOOL 32

This is a waste to energy-based grid connected power generation project. As per the latest version of the Tool 32: Positive List of Technologies” version 04, This technology is not included in the positive list.

Step 3: Is PA/CPA Aggregate size <= MSC thresholds (5 MW, 20 GWh/Y, 20 ktCO₂e/y) under Tool19?

Installed capacity of the project is 7.5 MW and hence doesn't come under micro activity thresholds.

Step 4: Does it meet one of the below conditions defined under Tool 19?

1. Is it implemented in an LDC/SIDC or a SUZ?
2. Does it involve technologies/measures included under para 11 (c), 12(b) and 13 (b) and end users are Households/communities/SMEs?
3. Does it comprise of specific grid connected renewable energy technologies recommended by the host country and approved by the Board?
4. Is it implemented in an off-grid area (≤ 12 hrs/day grid availability) supplying to households/communities?

Justification:

The above said conditionalities does not apply and hence the regular additionality approach needs to be followed as stated below:

As per methodological tool for the demonstration of additionality of small-scale project activities (Version 13.1, EB 105, Annex 0418), to establish the project additionality, it has to be shown that the project activity would not have occurred anyway due to at least one of the following barriers:

- **Investment barrier:** a financially more viable alternative to the project activity would have led to higher emissions;
- **Technological barrier:** a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
- **Barrier due to prevailing practice:** prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
- **Other barriers:** without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emission would have been higher

The project investor has selected the Investment barrier to demonstrate in a conservative and transparent manner that the project activity is financially unattractive. In line with the guidelines stipulated under Annex 34 of EB 358 (“Non-binding best practice examples to demonstrate additionality for SSC project activities”), a benchmark analysis has been used for the analysis and Equity IRR has been chosen as the financial indicator for the demonstration of the additionality.

Selection of Appropriate Benchmark:

The benchmark has been considered in accordance with CDM Tool 27- Investment Analysis, Version 12.0 EB 116 Annex 2, “The values in the table in the Appendix may also be used, as a simple default option”.

Methodology deployed for arriving at a suitable value of Benchmark using Default Value has been described below:

As the project activity generates power utilizing waste to energy, Group 1 as per para 5a of Appendix of EB 116 Annex 2 has been identified as a suitable category.

The investment analysis has been carried out in nominal terms. Accordingly, default value as given in table under the Appendix, EB 116 Annex 2 has been adjusted by adding suitable forecasted inflation rate taken from RBI.

In case of inflation data from RBI, benchmark has been calculated based on inflation rate. As per para 16 of EB 116, Annex 2, the inflation forecast should be for the duration of the crediting period.

The benchmark has been computed in the following manner:

Default Value Benchmark:

The cost of equity is determined by selecting the values provided in the table of the Appendix, i.e., Default values for cost of equity (expected return on equity) in the Tool 27: Investment analysis, version 12.0.

The Required return on equity (benchmark) was computed in the following manner:

$$\text{Nominal Benchmark}^{24} = \{(1+\text{Real Benchmark}) * (1+\text{Inflation rate})\}-1$$

Where:

Default value for Real Benchmark = 9.77% (as per Appendix of EB 116, Annex 2)

Inflation Rate forecast by RBI²⁵.

The Inflation rate forecast of the host country; India is published by the Reserve bank of India. Since the investment decision was made in 2017 the RBI Inflation rate forecast has been considered. In line with investment analysis tool, the project owner has considered the next 10 years average inflation rate.

Benchmark estimation:

The Cost of Equity has been considered using the “Tool 27: Investment analysis”, version 12.0 available at the time of decision making as well as the latest available value. As a conservative

²⁴ https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid15_v01.pdf

²⁵ [Reserve Bank of India - Publications \(rbi.org.in\)](http://Reserve Bank of India - Publications (rbi.org.in))

approach, the minimum value of benchmark has been considered as calculated using these 2 approaches.

Table under Appendix in EB 116, Annex 2 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India= 9.77%

Inflation Forecast	Benchmark
10 Years	10 Years
4.60%	14.82%

Hence a benchmark of 14.82% has been selected for both the project activities.

Chronology of events of the project activity is provided below

S. No	Activity	Date of Activity
1.	Preparation of Detailed Project Report	17-March-2017
2.	Date of Incorporation of the company	27-March-2017
3.	Signing of Concession Agreement	25-April-2017
4.	Signing of EPC Contract	04-April-2018
5.	Signing of Power Purchase Agreement	30-May-2018
6.	Commissioning Date	15-November-2021

Calculation and comparison of financial indicators

The period considered for Post Tax Equity IRR calculations is 25 years, which corresponds to the project life.

Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, is added back to net profits for the purpose of calculating the financial indicator. **Appropriateness for Consideration of Input Parameters:**

As per para 3 of EB48 Guidelines, Annex 11, the plant load factor shall be defined ex-ante in the CDM-PDD according to one of the following three options,

- a. The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval;
- b. The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company);

With reference to the loan application no: G5045001, dated 02.09.2020 to the Power Finance Corporation Ltd, the Detailed Project Report (DPR) consisting of the PLF details had been submitted. Accordingly, the Plant Load Factor (PLF) has been sourced from the Detailed Project Report (DPR) which complies with the EB48 Annex 11 Guidelines.

In India, generally the power purchase agreement (PPA) is signed with fixed tariff rate over the lifetime of the project activity. Hence a fixed tariff rate with no escalation has been considered for the investment analysis.

For the project activity, the Jamnagar Municipal Corporation has awarded the project at a fixed tariff of 7.07 INR/kWh, payable by Gujarat Urja Vikas Nigam Limited (GUVNL) is 6.31 INR/kWh with a differential amount of 0.76 INR/kWh as decided by the State Government.

The O&M cost has been calculated based on the GERC tariff order considering 6% of the project cost. The O&M cost consists of the statutory charges, spares, employee cost, administrative and general expense, consumables, repairs and maintenance and insurance expenses, etc.

As per the GERC Tariff Order 2016, the O&M cost is subjected to a fixed annual escalation of 5.72%. Hence the same has been considered for the investment analysis.

Input values considered for the IRR calculations are given below.

Particulars	Value	Unit	Source/Remarks
Quantity of MSW received	600	TPD	DPR
Capacity of the project	7.5	MW	DPR
Operating days	330	-	DPR
PLF First Year	65%	%	DPR
Annual Net generation First Year	38.61	GWh	Calculated
PLF from Second Year	75%	%	DPR
Annual Net generation from second year	44.550	GWh	Calculated
Auxiliary Electricity Consumption	12.00%	%	GERC Tariff Order, 2016, Pg 31
Net Electricity Generation- First Year	33.98	GWh	Calculated
Net Electricity Generation- from Second Year	39.20	GWh	Calculated
Project cost	1226.00	INR Million	DPR
Debt	70%	%	DPR
Equity	30%	%	DPR
Debt	858.20	INR Million	Calculated
Equity	367.80	INR Million	Calculated
Interest rate	11.80%	%	GERC Tariff Order, 2016, Pg 32
Debt Repayment tenure	15	years	DPR
Moratorium	1	year	DPR
Operation and Maintenance	73.6	INR Million	GERC Tariff Order, 2016, Pg 18
Annual Escalation for O&M	5.72%	%	GERC Tariff Order, 2016, Pg 18

Service tax on O&M services	15.00%	%	As per prevailing tax rates https://www.teachoo.com/3875/320/What-is-the-Rate-of-Service-Tax-for-2015-16-and-2016-17/category/Basics/
Tariff	7.07	Rs/kWh	GERC Tariff Order, 2016, Pg 32
Depreciation Rate (Book) (Up to 10 years)	7.00%	%	GERC Tariff Order, 2016, Pg 32
(11 to 20 years)	2.00%	%	GERC Tariff Order, 2016, Pg 32
Project cost	1226.00	INR Million	DPR
Land cost	0	INR Million	DPR
Gross Depreciable Value	1226.00	INR Million	Calculated
Salvage Value (@ 10%)	122.60	INR Million	Calculated
Net Depreciable Value	1103.40	INR Million	Calculated
Residual value	122.60	INR Million	Calculated
IT Depreciation Rate	7.69%	%	As Per Income Tax, Depreciation rates for power generating units (http://www.incometaxindia.gov.in/charts%20%20tables/depreciation%20rates.htm)
Income tax rate	34.27%	%	Calculated
MAT rate	21.13%	%	Calculated
Salvage Value	10%	%	GERC Tariff Order
Working Capital Fuel stock for 30 days O&M expenses for one month Receivables of one-month charges for sale of electricity Maintenance spares at 1% of the capital cost escalated at 5% per annum.	39.33	INR Million	GERC Tariff Order, 2016, Pg 26
Interest on working capital	11.80%		

Financial Year	FY 2017-18		
Income tax rate (%)	30.00%	Indian IT Act for FY 2017-18	Link
MAT (%)	18.50%	Indian IT Act for FY 2017-18	Link
Surcharge (%)	12.00%	Indian IT Act for FY 2017-18	Link

Education cess (%)	2.00%	Indian IT Act for FY 2017-18	Link
--------------------	-------	------------------------------	----------------------

Post Tax Equity IRR for the project activity against the benchmark values are shown in table below. Thus, it is evident that the project is not financially attractive as the equity IRR is below the benchmark value.

Post tax Equity IRR	
Project Activity	3.88%
Benchmark Value	14.82%

Sensitivity Analysis:

The robustness of the conclusion drawn above, namely that the project is not financially attractive, has been tested by subjecting critical assumptions to reasonable variation. As required by Annex 02 of EB 116, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. PP has identified the total revenue from the project activity is dependent on the Tariff, Plant Load Factor, Project Cost, and O&M Costs constitute more than 20% of the project costs. These factors have been subjected to a 10% variation on either side and the results of the sensitivity analysis indicate that even after applying such variation the EIRR does not cross the benchmark.

Variation %	-10%	Normal	10%	Variation required to reach benchmark	Value required to reach benchmark
Tariff	NA	3.88%	12.51%	13.21%	8.004 INR/kWh
PLF	NA	3.88%	11.56%	15.40%	87%
Project Cost	13.34%	3.88%	NA	-11.68%	1082.80 INR (Mn)
O&M Cost	8.77%	3.88%	NA	-28.55%	52.56 INR (Mn)

- a) **Tariff:** The Tariff rate of electricity used for investment analysis i.e., 7.07 INR/kWh is sourced from the GERC Tariff order applicable at the time of investment decision. Furthermore, the project will breach the benchmark value at a tariff variation of 13.21%. However, the actual tariff based on the PPAs signed is same to the estimated tariff and much below the tariff value required benchmarking value. Hence, increase in tariff is unlikely.
- b) **PLF:** The PLF value considered is based on DPR i.e., 75% during second year and the IRR breach the benchmark value at a PLF variation of 15.40%. The increase in PLF value to breach the benchmark is highly unlikely as the normative PLF of the MSW project is around 50%, which is lesser than the estimated PLF. Hence it is unlikely for the post-tax equity IRR to breach the benchmark.

- c) **Project Cost:** The project cost considered for investment analysis i.e., 1226.0 million INR. The cost is sourced from DPR which is based on the negotiations with supplier. A variation of -11.68% is required for IRR to breach benchmark which is not possible as the project is already commissioned. The actual cost incurred in commissioning of the project is higher than the value required to breach the benchmark which is within the sensitivity applied.
- d) **O&M Costs:** The sensitivity analysis reveals that O&M will breach the benchmark at negative values of -28.55% and is hypothetical case. Since the O&M cost is subject to escalation and subject to inflationary pressure, any reduction in the O&M costs is highly unlikely.

An analysis has been done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence. Based on sensitivity analysis it can be concluded that the project activity is additional with reasonable variation in values and is not likely to reach the benchmark value. The occurrence of these events is unlikely.

Conclusion:

As described above, the project fulfils all necessary requirements of additionality specified in the Tool 21- Demonstration of Additionality of Small-scale Project Activities, version 13.1. Hence, the project is deemed additional.

3.6 Methodology Deviations

There are no deviations in the applied methodology.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline Emissions from Solid Waste Disposal Sites

As per para 17, equation (1) of tool 04, version 08.1, the baseline emissions for a year is calculated using the following formula:

$$\left. \begin{matrix} BE_{CH_4,SWDS,y} \\ PE_{CH_4,SWDS,y} \\ LE_{CH_4,SWDS,y} \end{matrix} \right\} = \varphi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX) \times \frac{16}{12} \times F \times DOC_{f,y} \\ \times MCF_y \times \sum_{x=1}^y \sum_j (W_{j,x} \times DOC_j \times e^{-k_j \times (y-x)} \times (1 - e^{-k_j}))$$

Where,

$BE_{CH_4,SWDS,y}$	= Baseline, project or leakage methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (t CO ₂ e/yr)
$PE_{CH_4,SWDS,y}$	
$LE_{CH_4,SWDS,y}$	
x	= Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)
y	= Year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)
$DOC_{f,y}$	= Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	= Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
ϕ_y	= Model correction factor to account for model uncertainties for year y
f_y	= Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
GWP_{CH_4}	= Global Warming Potential of methane
OX	= Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	= Fraction of methane in the SWDS gas (volume fraction)
MCF_y	= Methane correction factor for year y
DOC_j	= Fraction of degradable organic carbon in the waste type j (weight fraction)
k	= Decay rate for the waste type j (1 / yr)
j	= Type of residual waste or types of waste in the MSW

As per para 27, equation (5) of tool 04, version 08.1, the amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x is calculated as follows:

$$W_{j,x} = W_x \times p_{j,x}$$

Where,

$W_{j,x}$	= Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
W_x	= Total amount of solid waste disposed or prevented from disposal in the SWDS in year x (t)
$p_{j,x}$	= Average fraction of the waste type j in the waste in year x (weight fraction)
j	= Type of residual waste or types of waste in the MSW
x	= Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

As per para 28, equation (7) of tool 04, version 08.1, the fraction of the waste type j in the waste for the year x or month i are calculated as follows:

$$p_{j,x} = \frac{\sum_{n=1}^{Z_x} p_{n,j,x}}{Z_x}$$

Where,

$p_{j,x}$ = Average fraction of the waste type j in the waste in year x (weight fraction)

Z_x = Number of samples collected during the year x

$p_{n,j,x}$ = Fraction of the waste type j in the sample n collected during the year x (weight fraction)

n = Samples collected in year x

The estimation of baseline emissions from solid waste disposal site is as follows:

Φ_y	Model Correction Factor	0.85
1-fy	Fraction of methane captured	1.0
GWP_{CH_4}	Global Warming Potential of CH ₄	28
1-OX	Oxidation factor	0.9
F	Fraction of CH ₄	0.5
$DOC_{f,y}$	Fraction of DOC decomposed	0.5
MCF_y	Methane Correction Factor	1

Quantity of RDF processed per day = 311 TPD

Operating days in year x = 330 days

Operating hours in day = 24 hours

Quantity of RDF processed per year (W_x) = 102630 Tonnes/year

$$W_{j,x} = W_x \times p_{j,x}$$

Composition	$p_{j,x}$ (%)	$W_{j,x}$ (MT)	DOC_j (%)	K_j (1/y)
Food	35.99%	36,937	15	0.400
Paper	1.15%	1,182	40	0.070
Coconut	0.00%	0	43	0.035
Green/Mix	13.42%	13,777	20	0.170
Wood	2.52%	2,590	43	0.035
Plastic	11.82%	12,134	0	-
Cloth	12.49%	12,822	24	0.070
Rubber	0.82%	842	0	0.070
Metal	0.04%	45	0	-
Glass	0.13%	133	0	-
Inert	21.60%	22,168	0	-

Emission from Food	Emission from paper	Emission from coconut	Emission from green mix	Emission from wood	Emission from cloth	Emission from rubber	BE _{CH4,SWDS,y} (tCO ₂ e/year)
13,041.8	228.3	0	3,075.7	273.5	1,485.4	0	18,105
21784	441.1	0	5,670.5	537.7	2,870.3	0	31,304
27,644.1	639.6	0	7,859.7	792.7	4,161.7	0	41,098
31,572.2	824.6	0	9,706.6	1039	5,365.7	0	48,508
34,205.3	997.2	0	11,264.8	1,276.8	6,488.3	0	54,232
35,970.3	1158	0	12,579.4	1,506.4	7,535	0	58,749
37,153.4	1308	0	13,688.5	1,728.1	8,511	0	62,389
Total Baseline Emissions from Solid waste Disposal Site							314,385

Baseline Emissions from Electricity Generation

As per para 22 of AMS- I.D, version 18.0, the baseline emissions include only CO₂ emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated using equation (1) of AMS-I. D, version 18.0 as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where,

BE_y = Baseline emissions in year y (t CO₂)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO₂/MWh)

The estimation of baseline emissions from electricity generation is as follows:

Power generation capacity	MW	7.5
Plant Load Factor (First Year)	%	65%
Plant Load Factor (From Second Year)	%	75%
Operating days	days	330
Total power generation (first year)	MWh/yr	38,610
Total power generation (from second year)	MWh/yr	44,550
Auxiliary Electricity Consumption	%	12%

Combined margin emissions factor

As per para 14 of Tool 7, version 07.0 the following steps have been followed.

- (a) **Step 1:** Identify the relevant electricity systems;
- (b) **Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);
- (c) **Step 3:** Select a method to determine the operating margin (OM);
- (d) **Step 4:** Calculate the operating margin emission factor according to the selected method;
- (e) **Step 5:** Calculate the build margin (BM) emission factor;
- (f) **Step 6:** Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool “For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems”. It also states that “If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used”. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However, since August 2006, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e., at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31-December-2013, the Southern grid has also been synchronized with the NEWNE grid; hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project owners may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The project owner has chosen only grid power plants in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

- (a) Simple OM; or

- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, Solar, low-cost biomass, nuclear and solar generation.

Share of Must Run (Hydro/Nuclear) (% of Net generation)					
	2018-19	2019-20	2020-21	2021-22	2022-23
India	14.5%	17.0%	16.5%	15.8%	15.33%

Source: Central Electricity Authority (CEA) Database Version 19, 2023²⁶

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus, the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- (a) **Ex-ante option:** if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

- (b) **Ex-post option:** if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the VCS verifier for verification. OM determined at validation stage will be the same

²⁶ https://cea.nic.in/wp-content/uploads/baseline/2024/04/CO2_DatabaseVersion_19_2022_23.xlsx

throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OM_{simple,y}}$) according to the selected method:

The operating margin emission factor has been calculated using a 3-year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
INDIAN Grid	2020-2021	2021-2022	2022-2023
	958,218	1,035,672	1,117,846
Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
INDIAN Grid	2020-2021	2021-2022	2022-2023
	0.9402	0.9605	0.9710
Net Generation in Operating Margin (GWh) (incl. Imports)			
INDIAN Grid	2020-2021	2021-2022	2022-2023
	958,218	1,035,672	1,117,846
Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
INDIAN Grid	2020-2021	2021-2022	2022-2023
	0.9402	0.9605	0.9710

Weighted Generation Operating Margin	
INDIAN Grid	0.9580

n factor ($EF_{BM,y}$):

Option 1 as described above is chosen to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

Build Margin (tCO ₂ /MWh) (not adjusted for imports)	
INDIAN Grid	2022-2023
	0.8670

STEP 6: Calculate the combined margin (CM) emissions factor:

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non-dispatch able generation types such as wind and solar photovoltaic, Tool 07- tool to calculate the emission factor for an electricity system, Version 07.0.0, EB 100, Annex100, Annex 4, allows to weigh the operating margin and Build margin at 75% and 25%, respectively for wind and solar projects and 50% and 50%, respectively for hydro and biomass projects.

As per para 85, equation (16) of Tool 07, version 07.0, the combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

$EF_{grid,BM,y}$	= Build margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$EF_{grid,OM,y}$	= Operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
w_{OM}	= Weighting of operating margin emissions factor (percent)
w_{BM}	= Weighting of build margin emissions factor (percent)

Combined Margin Emission Factor ($EF_{grid,CM,y}$) = 0.50*0.9580 + 0.50*0.8670 = 0.9125 tCO₂/MWh

Total power generation (from first year)	= 7.5*65%*330*24
	= 38,610 MWh/year
Total power generation (from second year)	= 7.5*75%*330*24
	= 44,550 MWh/year
Auxiliary Power Consumption	= 12%
Net Power Generation (first year)	= 38,610*(1-0.12)
	= 33,977 MWh/year
Net Power Generation (from second year)	= 44,550 *(1-0.12)
	= 39,204 MWh/year
Total Baseline Emission reduction (first year)	= 33,977 * 0.9125
	= 31,003 tCO ₂ e/year
Total Baseline Emission reduction (first year)	= 31,003 tCO₂e/year
Total Baseline Emission reduction (first year)	= 39,204 * 0.9125
	= 35,773 tCO ₂ e/year
Total Baseline Emission reduction (from second year)	= 35,773 tCO₂e/year

4.2 Project Emissions

As per para 22, equation (1) of AMS- III. E, version 17.0, the project emissions consist of

$$PE_y = PE_{y,comb} + PE_{y,transp} + PE_{y,power}$$

Where,

PE_y	= Project activity direct emissions in the year y (t CO ₂ e)
$PE_{y,comb}$	= Emissions through combustion and gasification of non-biomass carbon of waste and RDF/SB in the year y (t CO ₂ e)

$PE_{y,transp}$ = Emissions through incremental transportation in the year y (t CO₂e)

$PE_{y,power}$ = Emissions through electricity or diesel consumption in the year y (t CO₂e)

Project emissions from combustion process of RDF:

As per para 24, equation (2) of AMS- III. E, version 17.0, the project emissions from combustion of the non-biomass (i.e., fossil) carbon content of the wastes and RDF/SB and from the auxiliary fossil fuel consumed will be estimated as follows:

$$PE_{y,comb} = Q_{y,non-biomass} \times 44/12 + Q_{y,fuel} \times EF_{y,fuel}$$

Where,

$Q_{y,non-biomass}$ = Non-biomass carbon of the waste and RDF/SB combusted/gasified in the year y (tonnes of carbon)

$Q_{y,fuel}$ = Quantity of auxiliary fossil fuel used in the year y (tonnes)

$EF_{y,fuel}$ = CO₂ emission factor for the combustion of the auxiliary fossil fuel (tonnes CO₂ per tonne fuel, according to latest IPCC Guidelines)

The estimation of project emission from combustion of RDF is as follows:

$$Q_{non-biomass} = Q_y \times \text{Default dry matter content (\%)} \times FCC_{j,y} \times FFC_{j,y}$$

Where,

Q_y = Amount of waste combusted, gasified or mechanically/thermally treated by the project activity in each year

$FCC_{j,y}$ = Fraction of total carbon content in waste type j in year x

$FFC_{j,y}$ = Fraction of fossil carbon in total carbon content of waste type j in year x (weight fraction)

Waste Type	$p_{j,x}$	Q_y		Q_y	$FCC_{j,y}$	$FFC_{j,y}$	$Q_{y,non-biomass}$
j	%	TPY (Wet)	Default dry matter content (%)	TPY (Dry)	Total Carbon (%)	Fossil carbon in total carbon (%)	Non-biomass carbon of the RDF (TPY)
Food	35.99%	36,937	40%	14,775	38%	0%	0
Paper	1.15%	1,182	90%	1,064	46%	1%	5
Coconut	0.00%	0	85%	0	50%	0%	0
Green/Mix	13.42%	13,777	40%	5,511	49%	0%	0
Wood	2.52%	2,590	85%	2,202	50%	0%	0
Plastic	11.82%	12,134	100%	12,134	75%	100%	9,100

Cloth	12.49%	12,822	80%	10,257	50%	20%	1,026
Rubber	0.82%	842	84%	707	67%	20%	95
Metal	0.04%	45	100%	45	0%	0%	0
Glass	0.13%	133	100%	133	0%	0%	0
Inert	21.60%	22,168	90%	19,951	3%	100%	599
Total	100.0%	102,630		66,779			10,824

$Q_{y, fuel}$	1,155	litres
$p_{i, y}$	0.88	Kg/litre
$Q_{y, fuel}$	1.0164	tonnes
$EF_{y, fuel}$	74,800	kg/TJ
$NCV_{i, y}$	43.3	TJ/Gg
$EF_{y, fuel}$	3.239	tCO ₂ e/year

$$PE_{y,comb} = Q_{y,non-biomass} \times 44/12 + Q_{y,fuel} + EF_{y,fuel}$$

$$\begin{aligned} \text{Total project emissions from combustion of RDF (PE}_{y,comb}) &= (10,824 * 44/12) + \\ &= (1.0164 * 3.239) \\ &= \mathbf{39,692 \text{ tCO}_2\text{e/year}} \end{aligned}$$

Project Emissions from fossil fuel combustion

As per para 6, equation (1) of tool 03, version 03.0, the project emissions through diesel consumption are determined as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where,

$PE_{FC,j,y}$ = CO₂ emissions from fossil fuel combustion in process j during the year y (tCO₂/yr)

$FC_{i,j,y}$ = Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)

$COEF_{i,y}$ = CO₂ emission coefficient of fuel type i in year y (tCO₂/mass or volume unit)

As per para 7 (b), equation (4) of tool 03, version 03.0, the CO₂ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO₂ emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO_2,i,y}$$

Where,

$NCV_{i,y}$ = Weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$EF_{CO_2,i,y}$ = Weighted average CO₂ emission factor of fuel type i in year y (tCO₂/GJ)

The estimation of project emission from fossil-fuel combustion is as follows:

$FC_{i,j,y}$	77,358	Litres
$p_{i,y}$	0.88	kg/litre
$FC_{i,j,y}$	68.1	tonnes
$NCV_{i,y}$	43.3	TJ / Gg
$EF_{CO_2,i,y}$	74,800	Kg /TJ

Fuel consumption on site per year = (77,358 * 0.88)/1,000
= 68.1 tonnes

CO₂ emissions from fossil fuel combustion = (68.1 * 43.3 * 74,800)/1,000,000

Project Emissions from fossil fuel combustion = 220 tCO₂e/year

Project Emissions from Incremental Transportation

As per para 20, equation (1) of tool 12, version 01.1.0, the project or leakage emissions are determined as follows:

$$PE_{TR,m} = \sum_f D_{f,m} \times FR_{f,m} \times EF_{CO_2,f} \times 10^{-6}$$

Where,

$PE_{TR,m}$ = Project emissions from transportation of freight monitoring period m (t CO₂)

$D_{f,m}$ = Return trip distance between the origin and destination of freight transportation activity f in monitoring period m (km)

$FR_{f,m}$ = Total mass of freight transported in freight transportation activity f in monitoring period m (t)

$EF_{CO_2,f}$ = Default CO₂ emission factor for freight transportation activity f (g CO₂/t km)

f = Freight transportation activities conducted in the project activity in monitoring period m

Parameter	Description	Unit	Value	Remark
$D_{MSW,m}$	Return trip distance between the origin and destination of freight transportation for collection of MSW	km	0	-

FR_{MSW,m}	Total mass of freight transported in freight transportation for collection of MSW	t	600	
N	No of Operating days	days	330	
D_{inert,m}	Return trip distance between the origin and destination of freight transportation for disposal of inert waste	km	10	Plant Record
FR_{inert,m}	Total mass of freight transported in freight transportation for disposal of inert waste	TPD	289	Plant Record
D_{ash,m}	Return trip distance between the origin and destination of freight transportation for disposal of combustion residue	km	22	Plant Record
F_{ash,m}	Total mass of freight transported in freight transportation for disposal of combustion residue	TPD	47	Plant Record
EF_{CO2,f}	Default CO2 emission factor for freight transportation activity f	g CO2/t km	245	As per table 1 of tool 12, version 01.1.0 (For light Vehicles)
PE_{y,transp}	Project Emissions from Incremental Transportation	tCO₂/year	317	

The collection and transportation of MSW is under the scope of Jamnagar Municipal Corporation. The average distance between the project site and waste collection point is in same range of distance between the waste collection point and the landfill site in the baseline scenario. Hence the project emissions from freight transportation for collection of MSW is considered as zero.

4.3 Leakage

According to the applied methodology of AMS- III.E, version 17.0, para 37, the RDF produced is not subjected to anaerobic conditions before its combustion. Hence, no leakage emission is accounted in the project activity.

4.4 Net GHG Emission Reductions and Removals

As per para 43, equation (9) of AMS-I. D, ver. 18.0, Emission reductions are calculated as follows

$$ER_y = BE_y - PE_y - LE_y$$

ER_y = Emission reductions in year y (t CO₂e)

BE_y = Baseline emissions in year y (t CO₂e)

PE_y = Project emissions in year y (t CO₂e)

LE_y = Leakage emissions in year y (t CO₂e)

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
15-November-2021 to 14-November-2022	49,108	40,229	0	8,878
15-November-2022 to 14-November-2023	67,077	40,229	0	26,847
15-November-2023 to 14-November-2024	76,871	40,229	0	36,641
15-November-2024 to 14-November-2025	84,281	40,229	0	44,052
15-November-2025 to 14-November-2026	90,005	40,229	0	49,776
15-November-2026 to 14-November-2027	94,522	40,229	0	54,293
15-November-2027 to 14-November-2028	98,162	40,229	0	57,933
Total (7 years)	560,026	281,605	0	278,421

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	GWP _{CH₄}
Data unit	tCO ₂ e/tCH ₄
Description	Global Warming Potential for methane
Source of data	2019 refinement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, 5th Assessment Report ²⁷

²⁷ https://ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	For the calculation of the baseline emission
Comments	NA

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO ₂ e/MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 19.0, Nov- 2023 published by Central Electricity Authority (CEA), Government of India. ²⁸
Value applied	0.9580
Justification of choice of data or description of measurement methods and procedures applied	CO ₂ Emission Database, Version 19.0, Nov- 2023 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	For the calculation of the baseline emission
Comments	NA

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ e/MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 19.0, Nov- 2023 published by Central Electricity Authority (CEA), Government of India. ²⁹
Value applied	0.8670

²⁸ https://cea.nic.in/wp-content/uploads/baseline/2024/04/CO2_DatabaseVersion_19_2022_23.xlsx

²⁹ https://cea.nic.in/wp-content/uploads/baseline/2024/04/CO2_DatabaseVersion_19_2022_23.xlsx

Justification of choice of data or description of measurement methods and procedures applied	CO ₂ Emission Database, Version 19.0, Nov- 2023 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	For the calculation of the baseline emission
Comments	NA

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ e/MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 19.0, Nov- 2023 published by Central Electricity Authority (CEA), Government of India. ³⁰
Value applied	0.9125
Justification of choice of data or description of measurement methods and procedures applied	<p>The combined margin emissions factor is calculated as follows:</p> $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ <p>Where,</p> <p>$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)</p> <p>$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)</p> <p>W_{OM} = Weighting of operating margin emissions factor (%) = 50%</p> <p>W_{BM} = Weighting of operating margin emissions factor (%) = 50%</p>
Purpose of Data	For the calculation of baseline emissions
Comments	NA

Data / Parameter	ϕ_y
Data unit	-
Description	Default value for the model correction factor to account for model uncertainties

³⁰ https://cea.nic.in/wp-content/uploads/baseline/2024/04/CO2_DatabaseVersion_19_2022_23.xlsx

Source of data	Default value from Table 1 of tool 04, version 08.1.									
Value applied	0.85									
Justification of choice of data or description of measurement methods and procedures applied	<p>For baseline emissions: table below provides the appropriate factor based on the application of the tool (A or B) and the climate where the SWDS is located.</p> <p>Default values for the model correction factor</p> <table border="1"> <thead> <tr> <th></th> <th>Humid/wet conditions</th> <th>Dry conditions</th> </tr> </thead> <tbody> <tr> <td>Application A</td> <td>0.75</td> <td>0.75</td> </tr> <tr> <td>Application B</td> <td>0.85</td> <td>0.80</td> </tr> </tbody> </table> <p>The project site falls under tropical climatic condition, where, the mean annual temperature is 26.4 °C³¹ greater than 20 °C and the mean annual precipitation is 1100 mm³² greater than 1000 mm. Hence the default value for the model correction factor to account for model uncertainties for application B is 0.85.</p>		Humid/wet conditions	Dry conditions	Application A	0.75	0.75	Application B	0.85	0.80
	Humid/wet conditions	Dry conditions								
Application A	0.75	0.75								
Application B	0.85	0.80								
Purpose of Data	For the calculation of the baseline emission									
Comments	NA									

Data / Parameter	F
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	Default value from table 3 of tool 04, version 08.1 as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Purpose of Data	For the calculation of the baseline emission
Comments	NA

³¹ <https://www.indianclimate.com/show-data.php?request=JNNOVS4OEQ>

³² <https://jamnagar.nic.in/district-at-a-glance/>

Data / Parameter	OX
Data unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Default value from table 2 of tool 04, version 08.1
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Purpose of Data	For the calculation of the baseline emission
Comments	NA

Data / Parameter	$DOC_{f,y}$
Data unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	Default value from table 4 of tool 04, version 08.1 as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	MCF_y
Data unit	-
Description	Methane correction factor

Source of data	Default value from table 5 of tool 04, version 08.1 as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	1.0
Justification of choice of data or description of measurement methods and procedures applied	<p>In case that the SWDS does not have a water table above the bottom of the SWDS and in case of application A, then select the applicable value from the following:</p> <p>(a) 1.0 for anaerobic managed solid waste disposal sites. These must 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 will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste;</p> <p>(b) 0.5 for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to the waste layers: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system;</p> <p>(c) 0.8 for unmanaged solid waste disposal sites – deep. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters;</p> <p>(d) 0.4 for unmanaged-shallow solid waste disposal sites or stockpiles that are considered SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than five meters. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)</p>
Purpose of Data	For the calculation of the baseline emission
Comments	NA

Data / Parameter	DOC _j
Data unit	Weight fraction
Description	Fraction of degradable organic carbon in the waste type j (weight fraction)
Source of data	Default value from table 6 of tool 04, version 08.1 as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)

Value applied	<p>For MSW, the following values for the different waste types j should be applied:</p> <p>Default values for DOC_j</p> <table border="1"> <thead> <tr> <th>Waste type j</th> <th>DOC_j (% wet waste)</th> </tr> </thead> <tbody> <tr> <td>Wood and wood products</td> <td>43</td> </tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td> <td>40</td> </tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td> <td>15</td> </tr> <tr> <td>Textiles</td> <td>24</td> </tr> <tr> <td>Garden, yard and park waste</td> <td>20</td> </tr> <tr> <td>Glass, plastic, metal, other inert waste</td> <td>0</td> </tr> </tbody> </table>	Waste type j	DOC_j (% wet waste)	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Waste type j	DOC_j (% wet waste)														
Wood and wood products	43														
Pulp, paper and cardboard (other than sludge)	40														
Food, food waste, beverages and tobacco (other than sludge)	15														
Textiles	24														
Garden, yard and park waste	20														
Glass, plastic, metal, other inert waste	0														
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)														
Purpose of Data	For the calculation of the baseline emission														
Comments	NA														

Data / Parameter	k_j
Data unit	1/yr
Description	Decay rate for the waste type j
Source of data	Default value from table 6 of tool 04, version 08.1 as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)

Value applied	<p>For MSW, the following values for the different waste types j should be applied:</p> <p>Default values for kj</p> <table border="1"> <thead> <tr> <th>Waste type j</th> <th>kj</th> </tr> </thead> <tbody> <tr> <td>Pulp, paper, cardboard (other than sludge), textiles</td> <td>0.070</td> </tr> <tr> <td>Wood, wood products and straw</td> <td>0.035</td> </tr> <tr> <td>Other (non-food) organic putrescible garden and park waste</td> <td>0.17</td> </tr> <tr> <td>Food, food waste, sewage sludge, beverages and tobacco</td> <td>0.40</td> </tr> </tbody> </table>	Waste type j	kj	Pulp, paper, cardboard (other than sludge), textiles	0.070	Wood, wood products and straw	0.035	Other (non-food) organic putrescible garden and park waste	0.17	Food, food waste, sewage sludge, beverages and tobacco	0.40
Waste type j	kj										
Pulp, paper, cardboard (other than sludge), textiles	0.070										
Wood, wood products and straw	0.035										
Other (non-food) organic putrescible garden and park waste	0.17										
Food, food waste, sewage sludge, beverages and tobacco	0.40										
Justification of choice of data or description of measurement methods and procedures applied	<p>The project site falls under tropical climatic condition, where, the mean annual temperature is 26.4 °C³³ greater than 20 °C and the mean annual precipitation is 1100 mm³⁴ greater than 1000 mm. Hence the default value for the decay rate for waste type is taken from table 7 of tool 04, version 08.1.</p>										
Purpose of Data	For the calculation of the baseline emission										
Comments	NA										

Data / Parameter	FFC _j
Data unit	%
Description	Fraction of fossil carbon in total carbon content of waste type j
Source of data	Table 2.4, chapter 2, volume 5 of IPCC 2006 guidelines

³³ <https://www.indianclimate.com/show-data.php?request=JNNOVS4OEQ>

³⁴ <https://jamnagar.nic.in/district-at-a-glance/>

Value applied	For MSW the following values for the different waste types j may be applied: Default values for FCC _j																								
	<table border="1"> <thead> <tr> <th>Waste type j</th> <th>Fossil carbon fraction in % of total carbon</th> </tr> </thead> <tbody> <tr> <td>Paper/cardboard</td> <td>1</td> </tr> <tr> <td>Textiles</td> <td>20</td> </tr> <tr> <td>Food waste</td> <td>-</td> </tr> <tr> <td>Wood</td> <td>-</td> </tr> <tr> <td>Garden and Park waste</td> <td>0</td> </tr> <tr> <td>Nappies</td> <td>10</td> </tr> <tr> <td>Rubber and Leather</td> <td>20</td> </tr> <tr> <td>Plastics</td> <td>100</td> </tr> <tr> <td>Metal</td> <td>NA</td> </tr> <tr> <td>Glass</td> <td>NA</td> </tr> <tr> <td>Other, inert waste</td> <td>100</td> </tr> </tbody> </table>	Waste type j	Fossil carbon fraction in % of total carbon	Paper/cardboard	1	Textiles	20	Food waste	-	Wood	-	Garden and Park waste	0	Nappies	10	Rubber and Leather	20	Plastics	100	Metal	NA	Glass	NA	Other, inert waste	100
Waste type j	Fossil carbon fraction in % of total carbon																								
Paper/cardboard	1																								
Textiles	20																								
Food waste	-																								
Wood	-																								
Garden and Park waste	0																								
Nappies	10																								
Rubber and Leather	20																								
Plastics	100																								
Metal	NA																								
Glass	NA																								
Other, inert waste	100																								
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 2.4)																								
Purpose of Data	For the calculation of the project emission																								
Comments	NA																								

Data / Parameter	FCC _j
Data unit	%
Description	Fraction of total carbon content in waste type j
Source of data	Table 2.4, chapter 2, volume 5 of IPCC 2006 guidelines

Value applied	<p>For MSW the following values for the different waste types j may be applied:</p> <p>Default values for FCCj</p> <table border="1"> <thead> <tr> <th>Waste type j</th> <th>Total carbon content in % of dry weight</th> </tr> </thead> <tbody> <tr> <td>Paper/cardboard</td> <td>46</td> </tr> <tr> <td>Textiles</td> <td>50</td> </tr> <tr> <td>Food waste</td> <td>38</td> </tr> <tr> <td>Wood</td> <td>50</td> </tr> <tr> <td>Garden and Park waste</td> <td>49</td> </tr> <tr> <td>Nappies</td> <td>70</td> </tr> <tr> <td>Rubber and Leather</td> <td>67</td> </tr> <tr> <td>Plastics</td> <td>75</td> </tr> <tr> <td>Metal</td> <td>NA</td> </tr> <tr> <td>Glass</td> <td>NA</td> </tr> <tr> <td>Other, inert waste</td> <td>3</td> </tr> </tbody> </table>	Waste type j	Total carbon content in % of dry weight	Paper/cardboard	46	Textiles	50	Food waste	38	Wood	50	Garden and Park waste	49	Nappies	70	Rubber and Leather	67	Plastics	75	Metal	NA	Glass	NA	Other, inert waste	3
Waste type j	Total carbon content in % of dry weight																								
Paper/cardboard	46																								
Textiles	50																								
Food waste	38																								
Wood	50																								
Garden and Park waste	49																								
Nappies	70																								
Rubber and Leather	67																								
Plastics	75																								
Metal	NA																								
Glass	NA																								
Other, inert waste	3																								
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 2.4)																								
Purpose of Data	For the calculation of the project emission																								
Comments	NA																								

Data / Parameter	Dry matter content in % of wet weight																								
Data unit	%																								
Description	Dry matter content in % of wet weight																								
Source of data	Table 2.4, chapter 2, volume 5 of IPCC 2006 guidelines																								
Value applied	<table border="1"> <thead> <tr> <th>Waste type j</th> <th>Dry matter content in % of wet weight</th> </tr> </thead> <tbody> <tr> <td>Paper/cardboard</td> <td>90</td> </tr> <tr> <td>Textiles</td> <td>80</td> </tr> <tr> <td>Food waste</td> <td>40</td> </tr> <tr> <td>Wood</td> <td>85</td> </tr> <tr> <td>Garden and Park waste</td> <td>40</td> </tr> <tr> <td>Nappies</td> <td>40</td> </tr> <tr> <td>Rubber and Leather</td> <td>84</td> </tr> <tr> <td>Plastics</td> <td>100</td> </tr> <tr> <td>Metal</td> <td>100</td> </tr> <tr> <td>Glass</td> <td>100</td> </tr> <tr> <td>Other, inert waste</td> <td>90</td> </tr> </tbody> </table>	Waste type j	Dry matter content in % of wet weight	Paper/cardboard	90	Textiles	80	Food waste	40	Wood	85	Garden and Park waste	40	Nappies	40	Rubber and Leather	84	Plastics	100	Metal	100	Glass	100	Other, inert waste	90
Waste type j	Dry matter content in % of wet weight																								
Paper/cardboard	90																								
Textiles	80																								
Food waste	40																								
Wood	85																								
Garden and Park waste	40																								
Nappies	40																								
Rubber and Leather	84																								
Plastics	100																								
Metal	100																								
Glass	100																								
Other, inert waste	90																								
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 2.4)																								
Purpose of Data	For the calculation of the project emission																								
Comments	NA																								

Data / Parameter	$NCV_{i,y}$
Data unit	TJ/Gg
Description	Weighted average net calorific value of fuel type i in year y
Source of data	Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories ³⁵
Value applied	For Diesel Oil- 43.3 TJ/Gg

³⁵ https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

Justification of choice of data or description of measurement methods and procedures applied	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of Data	For the calculation of the project emission
Comments	NA

Data / Parameter	$EF_{CO_2,i,y}$
Data unit	kg/TJ
Description	Weighted average CO ₂ emission factor of fuel type i in year y
Source of data	Table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories ³⁶
Value applied	For Diesel Oil- 74,800 kg/TJ
Justification of choice of data or description of measurement methods and procedures applied	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of Data	For the calculation of the project emission
Comments	NA

Data / Parameter	$\rho_{i,y}$
Data unit	kg/m ³
Description	Weighted average density of fuel type i in year y
Source of data	Regional or national default values
Value applied	For diesel oil- 880 kg/m ³
Justification of choice of data or description of	The density of diesel has been sourced from the data published by Indian Oil. ³⁷

³⁶ https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

³⁷ <https://iocl.com/light-diesel-oil>

measurement methods and procedures applied	
Purpose of Data	For the calculation of the project emission
Comments	NA

Data / Parameter	z_x
Data unit	-
Description	Number of samples collected during the year x
Source of data	Sampling Records
Value applied	Minimum of three samples every three months
Justification of choice of data or description of measurement methods and procedures applied	The MSW from truck load, pre-processing, boiler feed, star-screen reject will be sampled once in three months.
Purpose of Data	For the calculation of the baseline emission and project emission
Comments	NA

Data / Parameter	$EF_{CO_2,f}$						
Data unit	g CO ₂ /t km						
Description	Default CO ₂ emission factor for freight transportation activity f						
Source of data	Default						
Value applied	<table border="1"> <thead> <tr> <th>Vehicle class</th> <th>Emission factor (g CO₂/t km)</th> </tr> </thead> <tbody> <tr> <td>Light vehicles</td> <td>245</td> </tr> <tr> <td>Heavy vehicles</td> <td>129</td> </tr> </tbody> </table>	Vehicle class	Emission factor (g CO ₂ /t km)	Light vehicles	245	Heavy vehicles	129
Vehicle class	Emission factor (g CO ₂ /t km)						
Light vehicles	245						
Heavy vehicles	129						
Justification of choice of data or description of measurement methods and procedures applied	The default CO ₂ emission factors take into account emissions generated by loaded outbound trips and empty return trips. For light vehicles, the emission factor was obtained from empirical data from European vehicles. For heavy vehicles, the emission factor has been derived based on custom design transient speed-time-gradient drive cycle (adapted from the international FIGE cycle), vehicle dimensional data, mathematical analysis of loading scenarios, and dynamic modelling based on engine power profiles, which, in turn, are a function of gross vehicle mass (GVM), load						

	factor, speed/acceleration profiles and road gradient. The following assumptions on key parameters have been made: an average driving speed of 30 km/h, an average gradient of 1%, and a load factor attained when biomass ⁵ is transported were assumed.
Purpose of Data	For the calculation of the project emission
Comments	NA

5.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}																			
Data unit	MWh/Year																			
Description	Quantity of net electricity generation supplied by the project (Waste to Energy) plant/unit to the grid in year y																			
Source of data	JMR Reports																			
Description of measurement methods and procedures to be applied	<p>The Net electricity generated is calculated based on Export-import.</p> <p>Monthly meter readings are taken from the main and check meter installed at metering point and certified by the representatives of electricity officials and the representatives of the project participant. The Joint Meter Reports is cross checked with the monthly invoices.</p>																			
Frequency of monitoring/recording	Continuously measured and monthly recorded																			
Value applied	Net Power Generation (first year)- 33,977 MWh/year Net Power Generation (from second year)- 39,204 MWh/year																			
Monitoring equipment	Energy meters of accuracy class 0.2s <table border="1" data-bbox="634 1446 1416 1740"> <thead> <tr> <th></th> <th>Main Meter</th> <th>Check Meter</th> </tr> </thead> <tbody> <tr> <td>Type of meter</td> <td colspan="2">Bi-directional</td> </tr> <tr> <td>Location of meter</td> <td colspan="2">GETCO 66kv Substation Navagam Ghed</td> </tr> <tr> <td>Accuracy class of meter</td> <td>0.2s</td> <td>0.2s</td> </tr> <tr> <td>Serial number of meters</td> <td>GJ4651A</td> <td>GJ4919A</td> </tr> <tr> <td>Calibration Frequency</td> <td colspan="2">Once in 5 years³⁸</td> </tr> </tbody> </table>			Main Meter	Check Meter	Type of meter	Bi-directional		Location of meter	GETCO 66kv Substation Navagam Ghed		Accuracy class of meter	0.2s	0.2s	Serial number of meters	GJ4651A	GJ4919A	Calibration Frequency	Once in 5 years ³⁸	
	Main Meter	Check Meter																		
Type of meter	Bi-directional																			
Location of meter	GETCO 66kv Substation Navagam Ghed																			
Accuracy class of meter	0.2s	0.2s																		
Serial number of meters	GJ4651A	GJ4919A																		
Calibration Frequency	Once in 5 years ³⁸																			

³⁸ https://cea.nic.in/wp-content/uploads/2020/02/meter_reg.pdf

QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.
Purpose of data	For the calculation of the baseline emission
Calculation method	NA
Comments	NA

Data / Parameter	Electricity Consumed by the project activity																
Data unit	MWh/Year																
Description	Quantity of net electricity consumed by the project activity from the grid in year y																
Source of data	JMR Reports																
Description of measurement methods and procedures to be applied	<p>The Net electricity is calculated based on Export- import.</p> <p>Monthly meter readings are taken from the main and check meter installed at metering point and certified by the representatives of electricity officials and the representatives of the project participant. The Joint Meter Reports is cross checked with the monthly invoices.</p>																
Frequency of monitoring/recording	Continuously measured and monthly recorded																
Value applied	Net Electricity Consumed (first year)- 4,633 MWh/year Net Electricity Consumed (from second year)- 5,346 MWh/year																
Monitoring equipment	Energy meters of accuracy class 0.2s <table border="1" data-bbox="634 1577 1417 1827"> <tr> <td></td> <td>Main Meter</td> <td>Check Meter</td> </tr> <tr> <td>Type of meter</td> <td colspan="2">Bi-directional</td> </tr> <tr> <td>Location of meter</td> <td colspan="2">GETCO 66kv Substation Navagam Ghed</td> </tr> <tr> <td>Accuracy class of meter</td> <td>0.2s</td> <td>0.2s</td> </tr> <tr> <td>Serial number of meters</td> <td>GJ4651A</td> <td>GJ4919A</td> </tr> </table>			Main Meter	Check Meter	Type of meter	Bi-directional		Location of meter	GETCO 66kv Substation Navagam Ghed		Accuracy class of meter	0.2s	0.2s	Serial number of meters	GJ4651A	GJ4919A
	Main Meter	Check Meter															
Type of meter	Bi-directional																
Location of meter	GETCO 66kv Substation Navagam Ghed																
Accuracy class of meter	0.2s	0.2s															
Serial number of meters	GJ4651A	GJ4919A															

	Calibration Frequency	Once in 5 years ³⁹
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.	
Purpose of data	For the calculation of the project emission	
Calculation method	NA	
Comments	As per the GERC Tariff order, the auxiliary electricity consumption for RDF based MSW project calculated as 12% of the gross electricity generation by the project activity.	

Data / Parameter	W_x	
Data unit	tonnes per day	
Description	Total amount of waste disposed in a SWDS in year x	
Source of data	Weigh Bridge Records	
Description of measurement methods and procedures to be applied	The MSW load transported to the project site is measured using weigh bridge.	
Frequency of monitoring/recording	The quantity of waste delivered will be monitored on daily basis and recorded.	
Value applied	311 tonnes per day	
Monitoring equipment	Weigh Bridge	
QA/QC procedures to be applied	The weigh bridge calibration details are provided below:	
	Serial No.	1) H-941-F-19 2) H-938-F-19
	Calibration frequency	Once in 12 months ⁴⁰

³⁹ https://cea.nic.in/wp-content/uploads/2020/02/meter_reg.pdf

⁴⁰ Calibration Frequency- As per Schedule VIII, Rule 16(3), Office of the Controller, Legal Metrology, Gujarat State.

	Date of Calibration/ validity	15-December-2022/15-December-2023
	Certificate No.	2484718/JAM/2022/01
Purpose of data	For the calculation of the baseline emission and project emission	
Calculation method	Net weight of MSW Load= Gross weight of the truck with MSW load- Tare weight of empty truck Weight of MSW disposed in a SWDS in year x, W_x =Net weight of MSW Load – Inert waste	
Comments	The total quantity of waste received at the plant is 600 TPD. The waste is subjected to pre-processing, where the waste less than 20mm is rejected as inert waste. As per the waste characterization, out of 600 TPD waste, the processed RDF is 311 TPD remaining 289 TPD is the inert waste.	

Data / Parameter	$P_{n,j,x}$																			
Data unit	%																			
Description	Weight fraction of the waste type j in the sample n collected during the year x																			
Source of data	Sampling Records																			
Description of measurement methods and procedures to be applied	Random samples are collected after the pre-processing section (i.e.) from the vibro feeder, out of which representative sample of 25 kg is taken for analysis. The waste composition based on the waste types j are segregated and weighed for each waste fraction (measured on wet basis). Sampling is done on quarterly basis with minimum of three samples.																			
Frequency of monitoring/recording	Minimum of three samples every three months																			
Value applied	<table border="1"> <thead> <tr> <th>Description</th> <th>% composition of MSW</th> </tr> </thead> <tbody> <tr> <td>Food</td> <td>35.99%</td> </tr> <tr> <td>Paper</td> <td>1.15%</td> </tr> <tr> <td>Coconut</td> <td>0.00%</td> </tr> <tr> <td>Green/Mix</td> <td>13.42%</td> </tr> <tr> <td>Wood</td> <td>2.52%</td> </tr> <tr> <td>Plastic</td> <td>11.82%</td> </tr> <tr> <td>Cloth</td> <td>12.49%</td> </tr> <tr> <td>Rubber</td> <td>0.82%</td> </tr> </tbody> </table>	Description	% composition of MSW	Food	35.99%	Paper	1.15%	Coconut	0.00%	Green/Mix	13.42%	Wood	2.52%	Plastic	11.82%	Cloth	12.49%	Rubber	0.82%	
Description	% composition of MSW																			
Food	35.99%																			
Paper	1.15%																			
Coconut	0.00%																			
Green/Mix	13.42%																			
Wood	2.52%																			
Plastic	11.82%																			
Cloth	12.49%																			
Rubber	0.82%																			

	Metal	0.04%
	Glass	0.13%
	Inert	21.60%
	Total	100%
Monitoring equipment	Weighing Scale	
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.	
Purpose of data	For the calculation of the baseline emission and project emission	
Calculation method	NA	
Comments	NA	

Data / Parameter	Q_y
Data unit	Tonnes per day (TPD)
Description	Amount of waste combusted, gasified or mechanically/thermally treated by the project activity in each year y
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The quantity of RDF fed to the boiler will be measured through the load cells installed in the grab crane. The quantity of RDF consumed will be monitored on daily basis and recorded. The load cells in the grab crane will be subjected to periodic calibration (in accordance with the manufacturers specification).
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	311 TPD
Monitoring equipment	Load Cells
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.
Purpose of data	For the calculation of project emission

Calculation method	NA
Comments	<p>The project proponent lacked awareness on the monitoring requirements. The project proponent has attempted to install load cells to monitor the RDF fed into the boiler. However, the load cells operation has been consistently hampered as the existing load cell is equipped with wire rope in hanging position resulting in accurate weighing results when the grabber become tilted during material pick up.</p> <p>Therefore, the proponent is currently consulting with multiple OEMs to develop an alternative monitoring mechanism with customized “Static” load cell to weigh the RDF feed into the boiler, with installation expected by December 31, 2024, before the start of the first verification period.</p> <p>Currently, the amount of RDF combusted in the boiler is determined from weighbridge records, by excluding the quantity of inert waste after pre-processing the total amount of waste received in the plant.</p>

Data / Parameter	$Q_{y,ash}$		
Data unit	Tonnes per day (TPD)		
Description	Quantity of combustion residues generated by the project activity in each year y		
Source of data	Weigh Bridge Records		
Description of measurement methods and procedures to be applied	The residual waste from the controlled combustion process includes bottom ash and fly ash. The bottom ash and fly ash are handed to the brick manufacturers. The quantity of bottom ash and fly ash is measured through the weigh bridge records based on truck loads dispatched from the plant to the brick manufactures and their loading capacity. The quantity of residues generated from the combustion process will be monitored on daily basis and recorded.		
Frequency of monitoring/recording	The quantity of residues generated from the combustion process will be monitored on daily basis and recorded.		
Value applied	47 TPD		
Monitoring equipment	Weigh Bridge The weigh bridge calibration details are provided below: <table border="1" style="margin-left: 20px; width: 100%;"> <tr> <td style="width: 50%;">Serial No.</td> <td>1) H-941-F-19 2) H-938-F-19</td> </tr> </table>	Serial No.	1) H-941-F-19 2) H-938-F-19
Serial No.	1) H-941-F-19 2) H-938-F-19		

	Calibration frequency	Once in 12 months ⁴¹
	Date of Calibration/ validity	15-December-2022/15-December-2023
	Certificate No.	2484718/JAM/2022/01
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.	
Purpose of data	For the calculation of the project emission	
Calculation method	NA	
Comments	NA	

Data / Parameter	$Q_{y,non-biomass}$
Data unit	Tonnes per year
Description	Quantity of non-biomass carbon content of the RDF combusted in each year y
Source of data	Sampling Records
Description of measurement methods and procedures to be applied	Random samples are collected after the pre-processing section (i.e.) from the vibro feeder, out of which representative sample of 25 kg is taken for analysis. The waste composition based on the waste types j are segregated and weighed for each waste fraction. (measured on wet basis). The quantity of non-biomass carbon content of the RDF is calculated based on the IPCC default values of total carbon content (FCC) and fossil carbon content (FFC).
Frequency of monitoring/recording	Sampling is done on quarterly basis with minimum of three samples.
Value applied	8,982 tonnes per year
Monitoring equipment	Weighing Scale
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.

⁴¹ Calibration Frequency- As per Schedule VIII, Rule 16(3), Office of the Controller, Legal Metrology, Gujarat State.

Purpose of data	For the calculation of the project emission
Calculation method	<p>The quantity of non-biomass carbon content of the RDF is calculated based on the IPCC default values of total carbon content (FCC) and fossil carbon content (FFC).</p> $Q_{non-biomass} = Q_y \times \text{Default dry matter content (\%)} \times FCC_{j,y} \times FFC_{j,y}$ <p>Where,</p> <p>Q_y = Amount of waste combusted, gasified or mechanically/thermally treated by the project activity in each year</p> <p>$FCC_{j,y}$ = Fraction of total carbon content in waste type j in year x</p> <p>$FFC_{j,y}$ = Fraction of fossil carbon in total carbon content of waste type j in year x (weight fraction)</p>
Comments	NA

Data / Parameter	CT_y						
Data unit	Tonnes/truck						
Description	Average truck capacity for transportation						
Source of data	Weigh Bridge Records						
Description of measurement methods and procedures to be applied	Values are monitored via the recordings of the net capacity of the trucks at weighbridge readings and cross-checked with the vehicle licenses.						
Frequency of monitoring/recording	-						
Value applied	2 Tonnes/truck						
Monitoring equipment	<p>Weigh Bridge</p> <p>The weigh bridge calibration details are provided below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Serial No.</td> <td>1) H-941-F-19 2) H-938-F-19</td> </tr> <tr> <td>Calibration frequency</td> <td>Once in 12 months⁴²</td> </tr> <tr> <td>Date of Calibration/ validity</td> <td>15-December-2022/15-December-2023</td> </tr> </table>	Serial No.	1) H-941-F-19 2) H-938-F-19	Calibration frequency	Once in 12 months ⁴²	Date of Calibration/ validity	15-December-2022/15-December-2023
Serial No.	1) H-941-F-19 2) H-938-F-19						
Calibration frequency	Once in 12 months ⁴²						
Date of Calibration/ validity	15-December-2022/15-December-2023						

⁴² Calibration Frequency- As per Schedule VIII, Rule 16(3), Office of the Controller, Legal Metrology, Gujarat State.

	Certificate No.	2484718/JAM/2022/01
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.	
Purpose of data	For the calculation of the project emission	
Calculation method	NA	
Comments	NA	

Data / Parameter	$Q_{y,fuel}$
Data unit	Tonnes per year
Description	Quantity of auxiliary fossil fuel used in the year y
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The project involves consumption of diesel for the initial ignition in the boiler. The quantity of fuel consumed will be monitored and recorded. The data recorded can be cross checked with the fuel purchase bills.
Frequency of monitoring/recording	Daily measured and monthly recorded
Value applied	1.02 tonnes per year
Monitoring equipment	-
QA/QC procedures to be applied	NA
Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	NA

Data / Parameter	$FC_{i,j,y}$
Data unit	Tonnes per year
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Plant Records

Description of measurement methods and procedures to be applied	The project involves consumption of diesel for the waste handling vehicle, loader, DG set etc. The quantity of fuel consumed will be monitored using standard gauge daily and recorded. The data recorded can be cross checked with the fuel purchase bills.
Frequency of monitoring/recording	Daily measured and monthly recorded
Value applied	68.1 tonnes
Monitoring equipment	-
QA/QC procedures to be applied	NA
Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	NA

Data / Parameter	Distance for transporting the waste in the baseline and the project scenario
Data unit	km
Description	The distance of municipal solid waste transportation in the baseline scenario and in the project scenario.
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The average distance travelled by the truck is calculated through the odometer readings.
Frequency of monitoring/recording	Daily measured and monthly recorded
Value applied	0
Monitoring equipment	-
QA/QC procedures to be applied	NA
Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	The collection and transportation of MSW is under the scope of Jamnagar Municipal Corporation. The average distance between the project site and waste collection point is in same range of distance between the waste collection point and the landfill site in

the baseline scenario. Hence the project emissions from freight transportation for collection of MSW is considered as zero.

Data / Parameter	$D_{inert,m}$
Data unit	km
Description	Return trip distance between the origin and destination of freight transportation for disposal of inert waste in monitoring period m
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The average distance travelled by the truck is calculated through the odometer readings.
Frequency of monitoring/recording	Daily measured and monthly recorded
Value applied	10 km
Monitoring equipment	-
QA/QC procedures to be applied	NA
Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	The collection and transportation of inert waste is under the scope of Jamnagar Municipal Corporation. The inert waste will be disposed of at the Gulabnagar waste disposal site.
Data / Parameter	$D_{dash,m}$
Data unit	km
Description	Return trip distance between the origin and destination of freight transportation for disposal of combustion residue in monitoring period m
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The average distance travelled by the truck is calculated through the odometer readings.
Frequency of monitoring/recording	Daily measured and monthly recorded
Value applied	22 km
Monitoring equipment	-

QA/QC procedures to be applied	NA
Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	The collection and transportation of bottom ash and fly ash is under the scope of Jamnagar Municipal Corporation. Currently, the bottom ash and fly ash are handed to the brick manufacturers (Sree Jadeja Enterprises and Indian Tiles Industries, Jamnagar).

Data / Parameter	$FR_{inert, m}$								
Data unit	Tonnes								
Description	Total mass of freight transported in freight transportation for disposal of inert waste in monitoring period m								
Source of data	Weigh Bridge Records								
Description of measurement methods and procedures to be applied	Values are monitored via the recordings of the net capacity of the trucks at weighbridge readings and cross-checked with the vehicle licenses								
Frequency of monitoring/recording	Daily measured and monthly recorded								
Value applied	289 TPD								
Monitoring equipment	Weigh Bridge The weigh bridge calibration details are provided below: <table border="1" data-bbox="634 1360 1349 1606"> <tr> <td>Serial No.</td> <td>1) H-941-F-19 2) H-938-F-19</td> </tr> <tr> <td>Calibration frequency</td> <td>Once in 12 months⁴³</td> </tr> <tr> <td>Date of Calibration/ validity</td> <td>15-December-2022/15-December-2023</td> </tr> <tr> <td>Certificate No.</td> <td>2484718/JAM/2022/01</td> </tr> </table>	Serial No.	1) H-941-F-19 2) H-938-F-19	Calibration frequency	Once in 12 months ⁴³	Date of Calibration/ validity	15-December-2022/15-December-2023	Certificate No.	2484718/JAM/2022/01
Serial No.	1) H-941-F-19 2) H-938-F-19								
Calibration frequency	Once in 12 months ⁴³								
Date of Calibration/ validity	15-December-2022/15-December-2023								
Certificate No.	2484718/JAM/2022/01								
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.								

⁴³ Calibration Frequency- As per Schedule VIII, Rule 16(3), Office of the Controller, Legal Metrology, Gujarat State.

Purpose of data	For the calculation of the project emission
Calculation method	NA
Comments	NA

Data / Parameter	FR _{ash, m}								
Data unit	Tonnes								
Description	Total mass of freight transported in freight transportation for disposal of combustion residue in monitoring period m								
Source of data	Weigh Bridge Records								
Description of measurement methods and procedures to be applied	Values are monitored via the recordings of the net capacity of the trucks at weighbridge readings and cross-checked with the vehicle licenses								
Frequency of monitoring/recording	Daily measured and monthly recorded								
Value applied	47 TPD								
Monitoring equipment	Weigh Bridge The weigh bridge calibration details are provided below: <table border="1" data-bbox="634 1100 1349 1341"> <tr> <td>Serial No.</td> <td>1) H-941-F-19 2) H-938-F-19</td> </tr> <tr> <td>Calibration frequency</td> <td>Once in 12 months⁴⁴</td> </tr> <tr> <td>Date of Calibration/ validity</td> <td>15-December-2022/15-December-2023</td> </tr> <tr> <td>Certificate No.</td> <td>2484718/JAM/2022/01</td> </tr> </table>	Serial No.	1) H-941-F-19 2) H-938-F-19	Calibration frequency	Once in 12 months ⁴⁴	Date of Calibration/ validity	15-December-2022/15-December-2023	Certificate No.	2484718/JAM/2022/01
Serial No.	1) H-941-F-19 2) H-938-F-19								
Calibration frequency	Once in 12 months ⁴⁴								
Date of Calibration/ validity	15-December-2022/15-December-2023								
Certificate No.	2484718/JAM/2022/01								
QA/QC procedures to be applied	The equipment used for the measurement will be calibrated as per the manufacturer specifications. In case of failure of calibration of the equipment during the emissions reduction verification stage, the maximum error specified by the manufacturers will be applied for the parameter for the calculation of emission reductions.								
Purpose of data	For the calculation of the project emission								
Calculation method	NA								
Comments	NA								

⁴⁴ Calibration Frequency- As per Schedule VIII, Rule 16(3), Office of the Controller, Legal Metrology, Gujarat State.

5.3 Monitoring Plan

The monitoring plan is developed to establish suitable data collection method for measurement & collection of data and maintenance of records according to the monitoring methodology of AMS.III. E. Version 17.0 and AMS.I.D. Version 18.0. The monitoring plan is project specific for which, the project performance with all relevant criteria will be monitored. Proper training will be provided to concerned personnel for operation purpose.

The purpose of monitoring is to calculate and monitor GHG emission reduction by the project activity. The monitoring plan, which is implemented by the project participant describes about the following aspects:

- Overall project management
- Monitoring Plan
- Emergency Preparedness
- Training on Monitoring & Archiving of Data and Internal Audit Procedures
- Quality Assurance and Quality Control (QA/QC) procedures

Overall Project Management and Team

The project owner organizes a separate team to be responsible for data collection, supervision and witness the whole process of data measuring and recording. A senior manager will be appointed to take full responsibility for the overall monitoring of the project. The monitoring and measurement will be carried out by designated monitoring officers. The site in-charge will be responsible for carrying out internal auditing and QA/QC. All the values from generation record will be checked with the invoices for consistency.

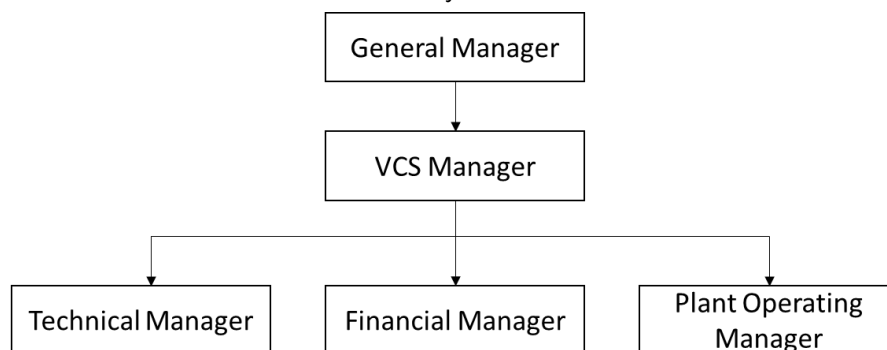


Figure 4: Structure of Monitoring Team

Monitoring Plan

The monitoring procedures will be carried out as mentioned in section 5.2. The data will be recorded on a continuous basis or as indicated in section 5.2 and backup of the same will be maintained. The data to be monitored include MSW composition and quantity, electricity exported and imported, auxiliary fuel consumption, quantity of combustion residues:

S. No	Parameter
1	MSW composition will be analysed in accordance with the required standards. A minimum of three samples every three months with the mean value valid for year y shall be undertaken.
2	The amount of waste to be combusted will be measured and recorded continuously through the load cells installed at the grab crane. The data will be aggregated monthly and annually.
3	The amount of combustion residues will be measured and recorded continuously through weigh bridge records based on the number of truck loads dispatched from the plant to the brick manufactures and their load capacity. The data will be aggregated monthly and annually.
3	Electricity delivered to power grid by the project will be recorded by the electricity meter. Copies of receipts or invoices will be provided to the VVB for validation.
4	The grid electricity consumed by the project will be monitored using the electricity meter. Copies of receipts or invoices will be provided to the VVB for validation.
5	The quantity of auxiliary fossil fuel consumed in the project activity will be monitored daily and recorded. Copies of fuel purchase receipts or invoices will be provided to the VVB for validation
6	The quantity of non-biomass carbon content of the RDF combusted will be measured through sampling. Sampling is done on quarterly basis with minimum of three samples.
7	The distance for transportation of waste and the average truck capacity will be monitored and recorded.

In addition, the SDG parameters stated in section 1.17 will be monitored.

Personal Training:

The project employs qualified and experienced persons for plant operation. The training period is crucial for ensuring that employees are knowledgeable about the plant's operations, safety protocols, environmental regulations, and efficient use of resources. The project owner prioritizes safety training to ensure that all employees understand and follow safety protocols and procedures, including emergency response plans. This includes training on handling hazardous materials, operating equipment safely, and preventing accidents. The training course will be thoroughly and meticulously designed, highlighting the objectives, salient features, operational aspects and trouble shooting.

Emergency preparedness:

In case of any unforeseen event that is not covered under this monitoring plan, staff of the operation division will immediately inform the chief of the operation division. The chief of the operation division is then responsible to ensure that the cause for the unforeseen event is

detected, the event is remedied and for the period of time in which the unforeseen event has occurred uncertainty in data gathered is limited as much as possible.

Internal auditing

The internal auditing process involves a systematic and objective evaluation of the plant's operations, processes, and controls to ensure compliance with regulations, identify operational efficiencies, mitigate risks, and improve overall performance. The project owner will have a team of internal expertise in waste-to-energy technology, environmental regulations, health and safety, and financial management. Project owner will conduct the internal auditing by cross checking the data from the invoices and data logbooks for ensuring the quality and consistency of data measured and monitored for the purpose of emission reduction calculations.

Quality Assurance and Quality Control (QA/QC) procedures

Calibration of Measuring Equipment's:

The reliability of the monitoring system depends on the accuracy of the measuring instrument and the quality of the relevant equipment. Thus, all the meters will be regularly calibrated as per the frequency specified by the manufacturer. To assist in future verifications, the project owner will preserve the calibration records, along with the data files of project monitoring. Error check routines will be established on site and at the point of data storage to detect data measuring / transmission failures as well as malfunctions. In the case of malfunction of the meters, the meter supplier will provide technical support to engage the problem promptly and emission reductions during the corresponding period will be calculated conservatively. The installation of the electricity metering equipment will fulfil the requirements of the relevant national standard.

APPENDIX NO 1

Attendance sheet and photographs of stakeholder's consultation meeting:

"Local Stakeholder Consultation Meeting for 7.5 MW Waste to Energy Power Plant by GoodWatts WTE Jamnagar Private Limited in Gujarat, India"

Attendance Sheet

Project Proponent: GoodWatts WTE Jamnagar Private Limited

Date of meeting: 09-05-23

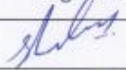
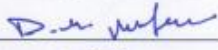






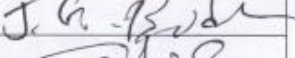

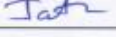
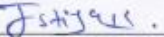







S. No	Name of the person	Signature
1	Sumit H. Naadani	
2	Deshraj M. Naadani	
3	Vallabh Khandelwala	
4	Chauhan Keshav	
5	Talakar Malay	
6	Nanda Milan	
7	Nikhil Feliya	
8	Mahesh Parmar	
9	Jay Patel	
10	Divyanshu Singh Gohil	
11	JATINBHAI FALIA	
12	Jstiyaru I Hala	
13	Hunif bhai	
14	chetansh chandani	
15	chetansh sikh Gohil	
16	Vijay sikh chandani	
17	mukund sikh Gohil	
18	Mahesh sikh chandani	
19	Rajiv sikh chandani	
20	Ramraj Jadhav sikh	



Figure 5: Local Stakeholders Consultation Meeting