LINFEN MSW INCINERATION AND POWER GENERATION PROJECT

Project title	Linfen MSW Incineration and Power Generation Project
Project ID	4818
Crediting period	14-June-2022 to 13-June-2043
Original date of issue	20-March-2024
Most recent date of issue	20-March-2024
Version	01
VCS Standard Version	4.5
Prepared by	Yu Zhouyang, Blue Whale Education Science Culture (Shen Zhen) Company Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Linfen MSW Incineration and Power Generation Project (hereafter referred to as the project) is located at Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R. China. The Project is invested, constructed and operated by Linfen Canvest Environmental Power Company Limited.

With two 400t/d MSW incineration lines, the project will incinerate 800 tons of MSW per day. The combustion system is composed of two 400t/d mechanical grate incinerators, matched with one set of 15MW steam turbine generator. The project will process 313,700[1] tons of MSW every year, and consume 46.0 tons of 0# light diesel as auxiliary fuel. The MSW incineration line works 8,000 hours annually, generating 97,187.9 MWh electricity, of which 77,750.3 MWh will be exported to the North China Power Grid (NCPG). The implementation of the project will meet the requirement of local MSW harmless treatment, and significantly improve local environment. Also, the project fits the priority development sector of integrated utilization of resource and energy saving of China, and helps reduce GHG emission that would occur in baseline scenarios such as power generating by fossil-fuel fired plants and MSW treatment at landfill.

By incinerating MSW that would otherwise be disposed of at landfill, the project avoids the emissions of methane that would be generated under landfill condition. In the meanwhile, by utilizing the waste heat from the incineration of MSW, the project generates electricity to replace equivalent electricity supplied from NCPG dominated by fossil fuel fired power plants. The baseline scenario of this project is the same as the scenario prior to the implementation of the project, namely the landfill gas is vented directly to the atmosphere and the equivalent electricity is supplied by the NCPG.

Before the implementation of the project, the MSW was disposed of at nearby landfill, where no landfill gas capturing system erected and the landfill gas was released to atmosphere directly. The equivalent electricity generated by the project was supplied by the NCPG. The baseline scenario identified in section 3 is the same as the scenario existing prior to the start of implementation of the project activity.

The project started construction on 20-04-2021 and put into operation on 14-06-2022. It is estimated that during the first 7-year renewable crediting period of the project (from 14-06-2022 to 13-06-2029), the average annual GHG emission reductions is expected to be 107,358 tCO_2e. The total amount of emission reductions is expected to be 751,505 tCO_2e during the first 7-year renewable crediting period.

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[1] 313,700t/a is the design value of the annual MSW intake in FSR to be treated. The designed amount of leachate accounts for 15% of the fresh MSW treated in the project and the annual amount of MSW incinerated is 266,700 t (313,700×(1-15%)=266,700) within the operation hour is 8000h per year as per the FSR.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	20-March-2024-02-May-2024	Verified Carbon Standard	CTI Certification Co., Ltd.	/
verification	/	/	/	/
Total	/	/	/	/

1.3 Sectoral Scope and Project Type

Sectoral scope[2]	Sectoral Scope 1: Energy industries Sectoral Scope 13: Waste handling and disposal
Project activity type	The project type of this project belongs to Type III "Other project activities not included in Type I or Type II".

1.4 Project Eligibility

1.4.1 General eligibility

The scope of the VCS Program includes:

1)The seven Kyoto Protocol greenhouse gases: The emission reductions of the project comes from two sources: a) the project avoids CH_4 emissions from atmospheric released methane at the landfill site treating the MSW in baseline scenario; b) the project reduces CO_2 emissions from the production of the equivalent amount of electricity that would otherwise be supplied by NCPG which is dominated by fossil fuel fired power plants. Thus, the project is applicable to this scope.

2) Ozone-depleting substances: Not applicable as the project does not involve ozone-depleting substances.

3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process: Not applicable as the project is not supported by a methodology approved under the VCS Program through the methodology approval process.

4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions): The project utilizes the

[2] Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes

methodology ACM0022 (Version 03.0) which is a methodology approved under CDM Program, an approved GHG program by VCS.

5) 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 is an MSW incineration and electricity generation project which incinerates MSW and use the waste heat from MSW incineration to generate electricity to be supplied to NCPG. Thus, the project does not belong to projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction.

According to section 3.1 of the VCS-Standard (version 4.5), establishing a consistent and standardized certification process is critical to ensuring the integrity of VCS projects. Accordingly, certain high-level requirements must be met by all projects, as set out below:

Reference to VCS Standard (Version 4.5)	Requirement	Justification
3.1.1	Projects shall meet all applicable rules and requirements set out under the VCS Program, including this document. Projects shall be guided by the principles set out in Section 2.2.1.	The project meets all applicable rules and requirements as set out under the VCS Program.
3.1.2	Projects shall apply methodologies eligible under the VCS Program. Methodologies shall be applied in full, including the full application of any tools or modules referred to by a methodology, noting the exception set out in Section 3.14.1. The list of methodologies and their validity periods is available on the Verra website.	The project applies CDM approved methodology ACM0022 (Version 03.0) which is an eligible VCS methodology along with tool or modules as applicable. Refer to section 3.1 and 3.2 of the JPM below for more details.
3.1.3	Projects shall apply the latest version of the applicable methodology in all cases unless a grace period applies to the project as set out in 3.22 below. Projects must update to the latest version of the methodology when reassessing the baseline and renewing a crediting period.	The project utilizes the methodology ACM0022 (Version 03.0) which is a methodology approved under CDM Program, an approved GHG program by VCS.
3.1.4	Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not the law is enforced.	The project is in compliance with currently applicable laws. According to the approval of Environmental Impact Assessment (EIA) of the project, the project complies with all Chinese relevant laws and regulations. Refer to section

		1.15 of the PD below for more details.
3.1.5	Where projects apply methodologies that permit the project proponent its own choice of model (see the VCS Program document VCS Program Definitions for the definition of model), the model shall meet the requirements set out in the VCS Methodology Requirements, and it shall be demonstrated at validation that the model is appropriate to the Project circumstances (i.e., use of the model will lead to an appropriate quantification of GHG emission reductions or carbon dioxide removals).	Not applicable. There are no model needs to be chosen by the project proponent as per the applied methodology ACM0022 (Version 03.0).
3.1.6	Where projects apply methodologies that permit the project proponent to choose a third-party default factor or standard to ascertain GHG emission data and any supporting data for establishing baseline scenarios and demonstrating additionality, such default factor or standard shall meet the requirements set out in the VCS Methodology Requirements.	The default factor or standard applied in the project are all methodologically permissible, so the default factor or standard meet the requirements set out in the VCS Program document VCS Methodology Requirements.
3.1.7	Where the rules and requirements under an approved GHG program conflict with the rules and requirements of the VCS Program, the rules and requirements of the VCS Program shall take precedence.	Not applicable.
3.1.8	Where projects apply methodologies from approved GHG programs, they shall conform with any specified capacity limits (see the VCS Program Definitions for the definition of capacity limit) and any other relevant requirements set out with respect to the application of the methodology and/or tools referenced by the methodology under those programs.	ACM0022 (Version 03.0) was applied by the project, which is approved by CDM programs, and the methodology has no specific requirements about the capacity limit. And then the application of the methodology and/or tools referenced by the methodology under the project activity is also applicable, please refer to section 3 for more details. So, it is applicable.
3.1.9	Where Verra issues new VCS Program rules, the effective dates of these requirements are set out	This is the first crediting period of the project, and it has followed all the latest

	in Appendix 3 Document History and Effective Dates or equivalent for other program documents, and are listed in a companion Summary of Effective Dates document which corresponds with each update.	requirements of Verra.

According to VCS Standard 4.5, Non-AFOLU projects shall initiate the project pipeline listing process and complete validation within two years of the project start date. The project is a non-AFOLU project, and the project request for pipeline listing on Verra Website on 28-March-2024, project status is expected to be changed to Under validation and the project started operation on 14-June-2022, less than two years ago.

The project does not belong to the excluded project activities in Table 1 of VCS Standard 4.5.

Thus, the project is eligible under the scope of VCS program.

1.4.2 AFOLU project eligibility

Not applicable. The project is not an AFOLU project.

1.4.3 Transfer project eligibility

Not applicable. The project is not a transfer project.

1.5 Project Design

The project has been designed to include a single installation of an activity.

1.5.1 Grouped project design

Not applicable as the project is not a grouped project.

1.6 Project Proponent

Organization name	Linfen Canvest Environmental Power Company Limited
Contact person	Mr. Wen Xiaoxiong
Title	Project Manager
Address	Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China
Telephone	+86-18536056688
Email	wenxiaoxiong@canvest.com.cn

1.7 Other Entities Involved in the Project

Organization name	Blue Whale Education Science Culture (Shen Zhen) Company Limited
Role in the project	Consultancy
Contact person	Mr. Yu Zhouyang
Title	General Manager
Address	Building B, No.39 Gangqian Road, Nanshan District, Shenzhen City, Guangdong Province, China
Telephone	+86-18025350904
Email	yuzhouyang@bwesc.info

1.8 Ownership

The project owner of the project is Linfen Canvest Environmental Power Company Limited. The project approval and EIA approval of local government are evidences for legislative right. Besides, the purchasing contracts of incinerators, steam turbine and generator, and the purchasing power agreement are the evidence for the ownership of the project.

1.9 Project Start Date

Project start date	14-June-2022
Justification	According to the VCS-Standard (version 4.5), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or carbon dioxide removals. The project is started treating MSW and produce greenhouse gas emission reduction since the operation start date of 14-June-2022. So, the project start date is 14-June-2022.

1.10 Project Crediting Period

Crediting period	☒ *Seven years, twice renewable* ☐ *Ten years, fixed* ☐ *Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)*
Start and end date of first crediting period	14-June-2022 to 13-June-2029

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the estimated annual GHG emission reductions/removals (ERRs) of the project:

☒ < 300,000 tCO_2e/year (project)

☐ ≥ 300,000 tCO_2e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
14-06-2022 – 31-12-2022	31,703
01-01-2023 – 31-12-2023	67,478
01-01-2024 – 31-12-2024	84,985
01-01-2025 – 31-12-2025	101,635
01-01-2026 – 31-12-2026	117,472
01-01-2027 – 31-12-2027	132,538
01-01-2028 – 31-12-2028	146,873
01-01-2029 – 13-06-2029	68,821
Total estimated ERRs during the first or fixed crediting period	751,505
Total number of years	7
Average annual ERRs	107,358

1.12 Description of the Project Activity

With two 400t/d MSW incineration production lines, the project will incinerate 800 tons of MSW per day. The combustion system is composed of two 400t/d mechanical grate incinerators, matched with one set of 15MW steam turbine generator. The project will process 313,700 tons of MSW every year, and consume 46.0 tons of 0# light diesel as auxiliary fuel. The energy from the auxiliary fossil fuel is less than 50%[3] of the energy from the incinerators. The MSW incineration line will work 8,000 hours every year, generating 97,187.9 MWh electricity, of which 77,750.3 MWh will be exported to the NCPG while the rest will be consumed for operation of the project facility. The cinder generated will be used

[3] As per FSR of the project, the annual consumption of 0# light diesel in the project is 46.0t, of which the net calorific value is 42.652 MJ/kg. Thus, the annual heat energy generated by light diesel is 1,962GJ (46,000 × 42.652/1000=1,962GJ. The annual power generation of the project is 97,187.9 MWh, and the corresponding thermal energy=97,187.9 × 10^3 × 3.6/1000=349,876GJ. Therefore, the heat energy generated by the auxiliary fossil fuel is=1,962 /349,846=0.56%<50%.

for production of construction material while the fly ash will be disposed at landfill sites. The flue gas will be emitted to atmosphere after being treated.

By incinerating MSW that would otherwise be disposed of at landfill sites, the project avoids the emission of methane that would be generated under landfill condition. Meanwhile, by utilizing the waste heat from the MSW treatment system, the project could reduce CO_2 emissions by generating electricity to displace equivalent electricity supplied by the NCPG which is dominated by fossil fuel-fired power plants.

The flow chart of the project is shown in Figure 1-1 and the key technical indicators of major equipment are shown in Table 1-1.

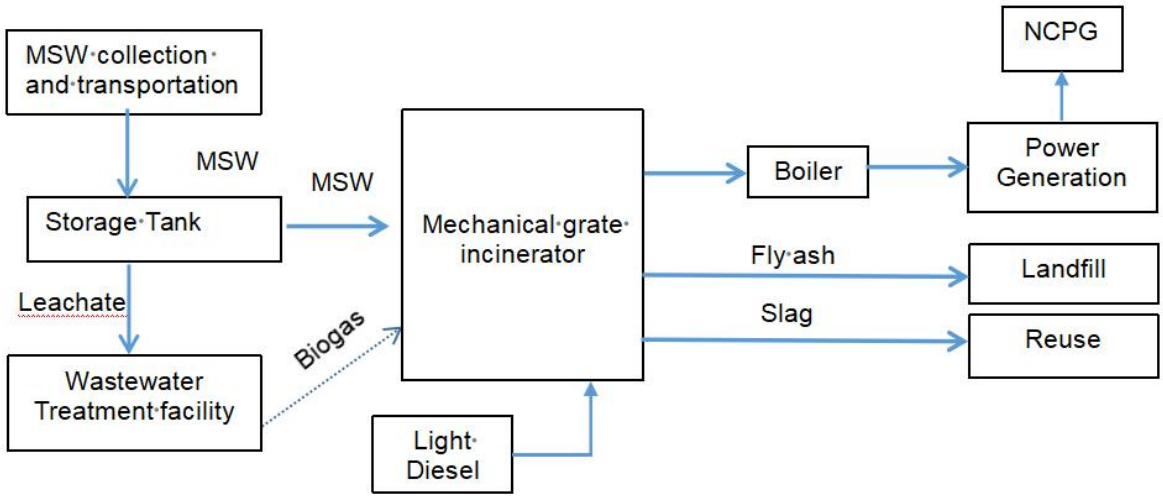


Figure 1-1 The flow chart of the project

Table 1-1 Key technical indicators of major equipment

Items	Parameters	Unit
Incinerator		
Quantity	2	Set
Treatment capacity	400	t/d
Type	SG400	
Service Life	30	year
Generator		
Type of Generator	QFW15-4/10.5	
Quantity	1	Set

Rated power	15	MW
Rated capacity	15	MVA
Rated Voltage	10.5	kV
Service Life	30	year
Steam Turbine-Generator		
Type of Steam Turbine	N15-3.9/390℃	
Quantity	1	Set
Rated power	15	MW
Pressure of the main steam	4.0	MPa
Temperature of the main	400	℃
Service Life	30	year
Boiler		
Type	SLC400-4.0/400	
Number	2	Set
Rated Capacity	45	t/h
Rated Steam Temperature	450	℃
Rated Steam Pressure	4.0	MPa
Service Life	30	year

1.13 Project Location

The project is located at Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China. The geographical coordinates are east longitude 110.50315°E and north latitude 34.95218°N, Figure 1-2 shows the geographic location of the project.

Figure 1-2 The location of the project Site

1.14 Conditions Prior to Project Initiation

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

The MSW was disposed of at nearby landfill, where no landfill gas capturing system erected and the landfill gases were released to atmosphere directly. The equivalent power generated by the project was supplied by NCPG dominated by fossil fuel-fired power plants.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project complies with all Chinese relevant laws and regulations, which mainly includes:

No.	Laws and Regulations	Laws and Regulations
1	Law of the People's Republic of China on the Prevention and Control of Solid Waste Pollution.	Clause 45 of the Law stipulate “improve level of comprehensive utilization and harmless treatment of MSW, accelerate development of MSW collection and treatment industry”. The project is to build a MSW incineration and electricity generation project, which fully complies with the Law.
2	Regulations of Prevention and Control of Environmental Pollution by Solid Waste in Shanxi Province	The regulation requires government at the county level to establish regulations for MSW sorting and build the system for MSW classified disposal, collection, transportation and treatment. The project adopts incineration system to treat MSW, which fully complies with the regulation.
3	Catalogue for the Guidance of Industrial Structure Adjustment (2024 revision).	The guidance encourages the construction and operation of MSW incineration project. The project adopts mechanical incinerators to treat MSW and recovers waste heat from incineration process for electricity generation, which fully complies with the guidance
4	Environmental Protection Law of the People’s Republic of China.	According to the requirements of the Environmental Protection Law of the People's Republic of China for construction projects, environmental impact assessment must be carried out for construction projects, and environmental protection measures must be taken in strict accordance with the evaluation results. In addition, construction projects must obtain approval from environmental protection authorities and strictly comply with relevant environmental protection laws and regulations. The project has completed the environmental impact assessment according to the regulations, and strictly implemented the environmental protection measures required by the EIA

		document. Construction of the project has also been approved by the local environmental protection bureau.
5	Law of the People's Republic of China on Environmental Impact Assessment.	According to the Environmental Impact Assessment Law of the People's Republic of China, the provisions on construction projects mainly include the following: construction projects must carry out environmental impact assessment in accordance with the law; Construction units must submit environmental impact assessment reports in accordance with regulations, and accept the review and supervision of relevant departments; Environmental impact assessment reports must be made public and subject to public supervision and participation; Construction projects must be designed, constructed and operated in accordance with the conclusions of the environmental impact assessment to ensure that the project does not have a serious impact on the environment. Environmental impact assessment has been carried out and the project has been approved by the local ecological environment bureau. Environmental impact assessment documents were made public prior to approval. The project is designed, constructed and operated in accordance with the conclusions of the EIA document.

The project has obtained the project approval and EIA approval from governmental authorities, which could demonstrate that local government permits construction and operation of the project. Therefore, the project is in compliance with laws, status and other regulatory frameworks.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

The project has neither been registered nor is seeking registration under any other GHG programs. The project is seeking registration only under the VCS program. Therefore, there is no possibility of double issuance..

1.16.2 Registration in Other GHG Programs

The project has neither been registered nor is seeking registration under any other GHG programs. The project is seeking registration only under the VCS program.

1.16.3 Projects Rejected by Other GHG Programs

The project has never been seeking registration under any other GHG Program, hence, the project has never been rejected by any other GHG programs.

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

The project is not included in any emission trading program or any other mechanism involving GHG allowance trading. In addition, the project does not reduce GHG emissions from any activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading. The net GHG emission reductions generated from the project will not be used for any compliance with emission trading programs or to meet binding limits on GHG emissions. Currently, China is developing a cap & trade scheme. However, China's national emissions trading scheme (ETS) is still evolving at very early stage, only fossil fuel-fired power plants in the power sector is included. China's ETS is expected to include all companies with annual GHG emissions greater than 26,000 tCO_2e in eight emission-intensive industries including power generation, petrochemicals, chemicals, building materials, non-ferrous metals, papermaking, steel and aviation. As the project is neither included in the above eight sectors nor the annual GHG emissions of the project proponent surpass 26,000 tCO_2e, it will not be included in the national ETS. Therefore, no emission cap will be enforced on the project proponent, nor can it participate in carbon transactions in the national ETS. The net GHG emission reductions of the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. PP will file a declaration of no double counting.

1.17.2 No Double Claiming with Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

The project proponent had signed a declaration of "No Double Counting Statement" and declaration of "Not involved in other GHG scheme" to promise that no double count emissions reductions will appear in this project.

1.17.3 Supply Chain (Scope 3) Emissions

The purpose of the project activity is to avoid methane emissions through incineration of MSW and use the waste heat for electricity generation. In absence of the project, MSW was disposed of at nearby landfill, where no landfill gas capturing system erected and the landfill gases were

released to atmosphere directly and the equivalent power generated by the project was supplied by NCPG dominated by fossil fuel-fired power plants. For the project activity, the emissions reductions are due to the changes of the way that the manure disposed. Therefore, the project activities will not impact the emissions of goods and services in a supply chain, i.e., Scope 3 emissions.

1.18 Sustainable Development Contributions

The Project will contribute to sustainable development in the following ways:

SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all: By utilizing the waste heat from the MSW treatment system, electricity could be generated to displace equivalent electricity from NCPG dominated by fossil fuel-fired plants. The MSW incineration lines will work 8,000 hours and generate 97,187.9 MWh electricity every year, of which 77,750.3 MWh will be exported to the NCPG. This contributes to one of the China's actions for promoting the sustainable developing, "By 2030, increase the share of non-fossil fuels in primary energy consumption to about 20 percent".

Thus, the project will contribute to SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all.

SDG 8 Promote inclusive and sustainable economic growth, employment and decent work for all: Construction and operation of the project will provide new employment opportunities with decent income, which will bring positive effect on the local economy. During the crediting period, direct and indirect employment opportunities will be generated, which increased income of local residents and improve economic growth. This is meets one of the China's action plans "Increase labour force participation rate through implementation of the classification policy. Vigorously enforce the Law on Promotion of Employment."

Thus, the project will contribute to SDG 8 Promote inclusive and sustainable economic growth, employment and decent work for all.

SDG 13 Take urgent action to combat climate change and its impacts: The project avoids the emissions of methane that would be generated under landfill condition. Meanwhile, CO_2 emission would be reduced by utilizing the waste heat from the MSW treatment system to generate electricity. The annual average amount of exported electricity is estimated to 77,750.3 MWh in the total crediting period. And the expected total emission reductions are 751,505tCO_2e during the first 7-year renewable crediting period (from 14-06-2022 to 13-06-2029), with average annual emission reductions 107,358 tCO_2e. This contributes to achieving one of China's stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas".

Thus, the project will contribute to SDG 13 Take urgent action to combat climate change and its impacts.

SDG	Indicators	Chinese Sustainable Development Progress	Project activity contribution
SDG 7	Affordable and Clean Energy	The Chinese government promotes utilization of clean energy. Policies and regulations have been published to promote development of clean energy like wind, solar etc. The goal has been made that the total installed capacity of wind and solar power plants will be higher than 1,200 GW.	The waste heat generated during the incineration process will be used for electricity generation which will be supplied to NCPG.
SDG 8	Decent Work and Economic Growth	China continuously improves the quality and efficiency of development. In-depth implementation of the innovation-driven development strategy, the rapid development of small and medium-sized enterprises. Adhering to the policy of giving priority to employment, the unemployment rate has remained at a low level. By coordinating epidemic prevention and control and economic and social development, it has become the only major economy to achieve positive growth in 2020 and has made positive contributions to the recovery of the global economy.	The project will provide decent job opportunities and increase tax revenue, which will have a positive effect on the local economy. This contributes to one of Chinese actions for promoting sustainable developing: "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".

SDG 13	Climate Action.	In 2020, China's energy consumption per unit of GDP was reduced by 24.4% compared with 2012; carbon dioxide emissions per unit of GDP was reduced by 18.8% compared with 2015 and 48.4% compared with 2005, all of which have already fulfilled China's commitment to the international community in 2020 ahead of schedule.	The project avoids the emission of methane that would be generated under baseline condition and CO_2 emissions from fossil-fuel based electricity generation. This contributes to achieve one of Chinese stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas".

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

The project is the incineration of fresh MSW, not involved the process of leakage emission listed in ACM0022. The wastewater generated by the project will be reused as cooling water of the project while it meets the standard of “The reuse of urban recycling water —Water quality standard for industrial uses” (GB/T 19923- 2005) after the treatment. The incineration residues are sent to landfill site. No by-products involved in the project. Thus, the leakage of the project is zero as per ACM0022 and leakage management is not applicable to the project.

1.19.2 Commercially Sensitive Information

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

1.19.3 Further Information

There is no relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the GHG emission reductions or carbon dioxide removals, or the quantification of the project’s reductions or removals.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

The stakeholders have been identified as individuals who will be directly or indirectly impacted due to the project activity. Direct stakeholders are those who deemed to either have a direct influence on the project or be directly influenced by the project, including but not limit to local residents. The indirect stakeholders mainly include the consultant.

Stakeholder Description:

Stakeholder Category	Direct/Indirect Affected Direct	Relevance to the Project Activity
Local residents around the project site	Direct	It can provide them with new jobs.
Local government including development and reform commission, ecological environment bureau	Direct	Approval for construction and operation of the project. Daily supervision of normal operation of the project.
Blue Whale Education Science Culture (Shen Zhen) Company Limited	Indirect	Consultant of the carbon reduction project.

Legal or customary tenure/access rights

The project is located in rural areas. According to the Land Administration Law of the People's Republic of China, the land in rural areas and urban suburbs is owned by peasants collectively, except for those owned by the state as stipulated by law. The village committee is the legal representative of the peasants'

	collective land owners. The project land is leased by the villagers to the project owner in the project location by signing a lease agreement with a term of 30 years, as evidenced by the land lease agreement signed by the project supporter and the local village committee. All the villagers are informed and agree to this, and the attached lease contract contains a written document signed by the villager representative recommended by the local villagers, as well as a document of the contract farmers involved in the project land agreeing to the village committee to lease the project contractor The project owner authorizes Blue Whale Education Science Culture (Shen Zhen) Company Limited as consultant to develop and manage the VCS project and account. There is no uncertainty or change in land tenure arrangements, resource access rights, community-based property rights and customary rights, access rights or land ownership.
Stakeholder diversity and changes over time	Stakeholder diversity: The local residents around the project site, and the local government are affected by the project activity directly. The farmers around the project live in different villages, and they may have different social networks and ways of interacting. The economic situation of farmers is greatly affected by the type of crop grown and the quality of the harvest. Workers in government departments may come from different backgrounds and have different expertise and experience. Government authorities are responsible for regulating and approving the operation of the project, and different government authorities may have different policies and regulations. The project owner authorizes Blue Whale Education Science Culture (Shen Zhen) Company Limited as consultant to develop and manage the VCS project and account. During the crediting period, the consultant remains unchanged. Over time, the members of each group will adjust, but their groups will not change much in terms of society, economy, culture, etc..
Expected changes in well-being	The implementation of the project is expected to have a positive impact on the well-being and other characteristics of stakeholders. Relative to the baseline scenario of an open anaerobic pond, the project will bring about the following changes:

	Social welfare: The implementation of the project will promote local economic development, provide employment opportunities and promote the prosperity of the rural economy. Climate change Impact: The project avoids landfill of MSW by incineration of the MSW and electricity generation with waste heat, avoiding emission of methane produced by traditional landfill methods of MSW to the atmosphere and CO_2 emissions from fossil fuel fired electricity generation. Collectively, these changes will have a positive impact on villagers' livelihoods and living environment, while helping to improve ecosystem services and enhance the sustainability of local communities.
Location of stakeholders	This project is a MSW incineration and power generation project located in rural area, not towns or urban residential areas. It is expected to be affected by the project in the villages nearby, including Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China. There are no Indigenous Peoples or customary right holders at project site as per consultation with local governmental workers and checking website of local government. The stakeholders LCs (Local Communities) in the project area are primarily located in Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China. These individuals and groups have a direct interest in the management of fecal waste in the area and will be directly impacted by the project. Additionally, there are areas outside the project area like Nanqiao Village that are predicted to be impacted by the project. These may include neighboring villages and ecosystems that could be affected by operation of the project. It is important for the project to consider and mitigate any potential impacts on these areas.
Location of resources	The location of territories and resources which stakeholders own or to which they have customary access are located in Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	10-March-2021
Stakeholder engagement process	In a culturally appropriate way, a stakeholder meeting was held on 10-March-2021 prior to commencement of the project. In advance of the meeting, project information, contact information, meeting notice, etc. are posted on the bulletin board one week in advance. Language and gender sensitivity considerations and measures including widespread notice, ensuring voluntary participation of female and minorities were included in the conference invitations to nearby villages, local ecology and local government authority, ensuring broad participation. During the meeting, the project proponent explained the benefits, possible costs and potential risks of the project to the participants. In addition, a survey of the local population was conducted. The survey was conducted through distributing and collecting responses to a questionnaire. The questionnaire investigated the impact of the project on the local area from the aspects of environment, economy and employment, and whether the surveyed people supported the project construction. Gender sensitivity was ensured by the equal participation of men and women in the questionnaire. All questionnaires were returned with a 100% response rate.
Consultation outcome	In addition, FPIC (Free, prior, and informed consent) was discussed to ensure the legitimacy and transparency of the project. Risks, costs and benefits of project construction and operation and all relevant laws and regulations covering workers' rights in China (Law of the People's Republic of China on the Protection of the Rights and Interests of Women and Children) have been informed to stakeholders. The project proponent also introduced to local stakeholders the VCS validation and verification process to ensure the sustainability and environmental benefits achievement of the project. Based on the results of the discussion at the meeting and the questionnaires received for the survey, local stakeholders are supportive of construction of the project. A majority of surveyed stakeholders think the project will improve local economic development without adverse environmental impact. The survey shows that the stakeholders are supportive to the project.
Ongoing communication	In order to set up the mechanism for on-going communication with local stakeholder, a grievance book was put in Front Desk Administration of the PP. All stakeholders are allowed to record

	their grievances or comments in the book at any time, to ensure that their voices are fully heard. Communications with local stakeholders will take place regularly prior to verification. The key schedule of implementation for the project had been communicated to the local authority, the residents' committee, and the residents, whose views and suggestions (if any) were collected by the project proponent.
Stakeholder input	During the continuous communication with stakeholders, the project has not received any complaints, comments or suggestions from stakeholders.

2.1.3 Free Prior and Informed Consent

Obtaining consent	In order to obtain the consent and reach a transparent agreement from the stakeholders involved in the implementation of the project activities in Nanqiao Village, Yaodu District, Linfen City, Shanxi Province, P.R.China, including LCs and customary rights holders, we conducted a comprehensive and transparent consultation process. This includes holding community meetings, individual discussions, and soliciting input from relevant community leaders and representatives. Before project construction and implementation, all stakeholders expressed their approval for the construction and implementation of the project. During these consultations, PP provided detailed information about the project, including the nature, scale, speed, reversibility and scope of the proposed project or activity; The reason or purpose of the project and/or activity; Duration of project activities; Locations that will be affected; And a preliminary assessment of economic, social, cultural and environmental impacts, including potential risks and fair and equitable benefit-sharing, respecting the precautionary principle. In addition, we actively listen to concerns and feedback from our stakeholders and address any questions or concerns raised. Through this process, we were able to reach a transparent agreement with the community on the implementation of project activities. In addition, PP have been monitoring the situation in the community to identify any ongoing or unresolved conflicts that may be affected by the project. We take active steps to ensure that projects do not exacerbate or influence the outcome of these conflicts. This includes ongoing dialogue with communities and a

	commitment to adapt our approach as needed to avoid any negative impact on local dynamics.
Outcome of FPIC	The project does not occupy the villagers' house land, permanent basic farmland, and is not in the range of prohibited cultivation area, meets the requirements of Yaodu District aquaculture planning, and has obtained the approval of local Natural Resources and Planning Bureau. Therefore, the project does not involve land encroachment, non-consensual resettlement of residents and forced relocation. Prior to the commencement of the project, adequate communication was conducted with the local villagers, including the key project schedule, Project details, environmental protection, carbon development, risks, benefits, etc. have been disclosed and fully communicated in advance. All relevant arrangements are made with the free, prior and informed consent of stakeholders. All stakeholders expressed full support for the project.

2.1.4 Grievance Redress Procedure

Development process	In order to resolve complaints related to the project, PP have developed a complaint resolution process with stakeholders to ensure fair, transparent and timely processing. Here are the grievance resolution steps we have developed in partnership with stakeholders taking into account culturally appropriate conflict resolution methods: 1. Receiving Complaints: Any complaints related to the project will be received and recorded. The project owner has placed a comment book in the front office of the company and posted the contact person and contact information for stakeholders to submit complaints, either in writing, orally or through a designated contact person. 2. Hearing: Once a complaint is received, PP will schedule a hearing or meeting so that stakeholders can express their views and concerns within one or two days. This will provide an open platform to ensure that all relevant information is fully considered. 3. Response: Following the hearing or meeting, PP will provide a written response confirming that they have understood and documented the stakeholder's complaint and explaining the actions we will take within a reasonable time period. This will

	ensure transparency and continuity of communication. 4. Resolution of Complaints: PP will use the best efforts to resolve complaints within one week. This may include adopting appropriate conflict resolution methods, such as mediation, negotiation or other appropriate solutions. PP will work with stakeholders to ensure they are satisfied with the solution. These complaint resolution steps will ensure that PP will be able to address any project-related complaints in a timely and fair manner, while respecting the rights and concerns of our stakeholders.
Grievance redress procedure	The procedure for resolving complaints is as follows: 1.PP shall first attempt to proactively communicate and solve the problems of stakeholders through friendly negotiation, and provide a culturally appropriate written reply after both parties have reached an agreement on the solution; 2. Any problem that cannot be settled through friendly negotiation shall be mediated by a third party such as the village committee; 3. If no settlement can be reached through third party mediation, it shall be submitted to arbitration to the extent permitted by the law of the relevant jurisdiction, or to the competent court of the relevant jurisdiction, without prejudice to the ability of a party to submit a complaint to a competent supranational adjudication body (if any).

2.1.5 Public Comments

The project will be open for public comment on the verra website.

Comments received	Actions taken
The project will be open for public comment on the verra website.	/

2.2 Risks to Stakeholders and the Environment

	Risks identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	According to the project land lease contract, the project leased land conforms to the local

		environmental protection planning, is not in the forbidden zone, restricted zone, environmental red line planning area, and does not contain basic farmland. The owner of the project paid enough rent. As a result, the project has no impact on food security, land loss, yield loss, livelihoods of the local population and climate change.
Working conditions	No risk identified	The project has strictly implemented national and industry regulations and standards on labor safety and health, as well as Chinese labor law and local requirements， mitigation measures have been undertook as per the approved EIA and carry out regular occupational health and safety testing every year to ensure the safety and healthy working environment.
Safety of women and girls	No risk identified	This program does not admit underage girls. In the design phase of the project, the safety of women was taken into account and corresponding preventive measures were taken. For example, establish safe sanitation facilities to ensure that women are not subjected to gender discrimination or gender-based violence in the management of their faeces. During the implementation of the project, all personnel involved in the project are regularly trained in gender sensitivity, including awareness of gender discrimination and gender-based violence, and how to prevent and respond to these issues. The project has established effective monitoring and reporting mechanisms so that women can report any safety issues or acts of gender discrimination, ensuring that their voices are adequately addressed and protected.
Safety of minority and marginalized groups, including children	No risk identified	Project activities will provide equal job opportunities, will not discriminate against marginalized groups, and will try to provide some social support and assistance for local marginalized groups; The project does not recruit child workers. Therefore, the project does not pose a risk to

		marginalized groups, including children.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	1.Air Pollution The main air pollutants in the operating period of the project comprise of acid gases (SO_2, HCl, HF), heavy metals, dioxins and NO_x from the flue gas generated during the incineration process, and dust and odour from MSW tanks. 2.Waste water The waste water of the project is the leachate from the MSW tanks and domestic waste water. The treated waste water will be reused within the project and no effluent will be discharged.Noise 3.Pollution Noise is mainly caused by the induced-supply fans of the incineration, crushers, cooling tower, pumps, gas flow, incineration exhaust and the MSW trucks, where soundproof equipment such as	1. The flue gases will be treated through the introduction of multiple gas control technologies which is SNCR + semi-dry washing + dry washing + activated carbon adsorption and cloth-bag dusting process. After the treatment of the flue gas purification system, the exhaust gas will be emitted via an 80m chimney, fluorine hydrogenation emissions in the exhaust gas discharged from the incineration furnace must meet the limit requirements of EU Standard (EU2010/75). Other pollutant emissions must meet the requirements of the "Domestic waste incineration pollution control standard "(GB18485-2014). 2.The technologies used for waste water treatment comprise of physical-chemical technology, anaerobic technology, nitration-denitrification and aerobic MBR. The treated waste water will be reused within the project and no effluent will be discharged. 3.Soundproof equipment such as silencers will be installed. As per conclusion of the EIA, noise at the project boundary meets the requirements as set out in the "Standards of noise at boundary of industrial enterprises (GB12348-2008)". 4.The slag will be used for manufacturing building materials. The fly ash will be solidified onsite and disposed of in nearby landfill specially constructed for fly ash.

	silencers will be installed. 4.Solid Waste The slag and the fly ash are solid wastes generated during operation of the project.	

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	The project does not involve or engage in any form of discrimination based on gender, race, religion, sexual orientation or any other grounds. The program respects all rights granted to women by the Constitution of the People's Republic of China, the Labor Law of the People's Republic of China, and the Special Provisions on Labor Protection for Women Workers. There have been no complaints of sexual harassment since the project began. And the project has established a monitoring mechanism for complaints about sexual harassment to ensure that sexual harassment will not happen in the future.
Management experience	The management team of the project has the experience and expertise to effectively implement similar project activities. The team members have many years of working experience in the field of MSW management and environmental protection, and have relevant skills and expertise in project planning, implementation and supervision to effectively manage and drive the implementation of the project. Manager of the project has experience of engaging communities and the management team will be trained for engaging communities. In addition, PP has developed a recruitment strategy to fill gaps in skills and experience that may exist in the team and will be looking for people with relevant experience and expertise to join the team to ensure that the project is supported and guided.
Gender equity in labor and work	The project has male and female employees, and there are female employees in management positions. There is no significant gender difference between female employees and male employees in terms of salary, promotion opportunities and welfare benefits, and employees of different genders have equal opportunities to obtain training and

	development resources. In regular employee satisfaction surveys, all employees feel that the project is treated equally in terms of gender and pay.
Human trafficking, forced labor, and child labor	PP adopts a compliant recruitment and employment policy to ensure that the recruitment and employment policies comply with relevant ILO standards and do not involve any form of human trafficking, forced labour and child labour. PP will conduct comprehensive background checks and comply with local labor laws and regulations to ensure that our employees are not exploited and abused. PP has put in place monitoring mechanisms to ensure that all employees and partners involved in the project are not involved in human trafficking, forced Labour and child Labour. They will conduct regular on-site inspections and audits to ensure that there are no violations of labor rights during the implementation of the project. Employees will work with partners who share the same commitment to labor rights to ensure that the entire supply chain is free from human trafficking, forced labor and child labor. PP will provide training to employees and partners on human trafficking, forced Labour and child Labour to increase their awareness of these issues and how to avoid and report possible violations.

2.3.2 Human Rights

In accordance with applicable laws such as International Human Rights Law, and relevant Chinese laws such as the Constitution of the People's Republic of China, the Labor Law of the People's Republic of China, the Anti-Discrimination Law of the People's Republic of China, the Law of the People's Republic of China on the Protection of Women's Rights and Interests, the Law of the People's Republic of China on the Protection of Minors etc., Safeguard the rights of LCs.

Meanwhile, PP actively work with local village committee to listen to their views and aspirations. and will respect their traditional knowledge, culture and customs and fully consider their views and interests in the planning and implementation of projects.

PP respects the rights of local peoples and local communities to land and natural resources and ensure that projects do not infringe on their land tenure, resource access and traditional ways of livelihood.

PP will prioritize working with Village committees to ensure they can directly benefit from the project and participate in the decision-making process.

PP will provide training and employment opportunities for villagers and village committee to upgrade their skills and participate in project implementation.

2.3.3 Indigenous Peoples and Cultural Heritage

There is no cultural heritage to be protected in or around the project site.

2.3.4 Property Rights

Rights to territories and resources	In the areas covered by the project, the following legal or customary ownership/acquisition rights exist: Land ownership: According to the relevant laws, land in rural and suburban areas is owned by peasant collectives, except where it is owned by the State by law. The land used in this project is owned by the local villagers collectively, and the project owner obtains the right to use it by signing a lease contract. Traditionally, the land occupied by the project is located at the foot of the mountain, because its geographical conditions are not suitable for farming, before the implementation of the project in the wasteland stage. The project does not involve any possible conflicts of rights between different stakeholders.
Respect for property rights	Contract protection: Through the signing of lease contracts, the protection of indigenous peoples' territory, property, customary rights and interests, such as land lease contracts, land development contracts, etc Participation in project consultations: Establish participatory consultation mechanisms, including for indigenous peoples, to ensure their participation in project management and decision-making processes and to safeguard their property rights. Environmental protection: Protect the ecological environment of the project site, protect the land ecological environment of indigenous peoples, and prevent environmental pollution and destruction from affecting their property rights. These measures help to ensure that indigenous peoples' land property rights are effectively protected, while respecting and protecting their traditional culture and way of life.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The process used to develop the benefit-sharing agreement with the affected stakeholder groups involved extensive consultation and collaboration with the local community. We conducted multiple meetings and discussions with the village leaders, farmers, and other community members to understand their needs and preferences. We also sought input from relevant government agencies and environmental organizations to ensure that the agreement was in line with local regulations and best practices. Through these consultations, we were able to identify the specific needs of the local farmers and develop a benefit-sharing agreement. Overall, the process used to develop the benefit-sharing agreement was inclusive, transparent, and responsive to the needs of the affected stakeholder groups. We believe that this collaborative approach will help to ensure the success and sustainability of the fecal waste treatment project and its positive impact on the local community.
Summary of the benefit sharing plan	The Agreement also includes the following for renegotiation: "Term of Agreement: This Agreement shall remain in force for the entire duration of the Fecal Waste Treatment Project unless otherwise terminated by mutual agreement of the organization and stakeholders". This means that the termination or extension of the term of the agreement will require the organization and stakeholders to negotiate and agree together to meet the needs and interests of both parties.
Approval and dissemination of benefit sharing plan	As per interview with local villagers, benefit- sharing agreement was agreed up on by the affected stakeholder groups. Prior to the signing of the agreement, PP communicated and discussed with the representatives of the local villagers to ensure that they were aware of the contents of the agreement and were able to make suggestions and comments. The agreement is written in the local language, ensuring that the content of the agreement is easy to understand and can be supported and endorsed by the local community. PP widely communicates the contents of the Agreement within the community, such as through bulletin boards, community meetings or other appropriate channels, so that the contents of the Agreement are readily accessible to stakeholders, and copies can be made available to all stakeholders so that they can consult them at any time. In addition, PP has established a feedback mechanism so that stakeholders can ask questions or comments at any time and ensure

	that their voices are heard and responded to.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure taken
Impacts on biodiversity and ecosystems	Possible impacts on the surrounding biodiversity: 1. Water resource pollution: Leachate from the MSW tanks and domestic waste water may flow into surrounding water bodies, resulting in water pollution and affecting aquatic biodiversity. 2. Soil pollution: The slag and the fly ash are solid wastes generated during operation of the project, affecting the balance of soil microorganisms and soil ecosystems, thus affecting the growth of surrounding plants and biodiversity. 3. Noise and odor pollution: The project may produce noise and odor, which will disturb the habitat and reproduction of the surrounding wild animals and affect their living conditions. 4. Ecosystem destruction: The construction of the project may lead to changes in land use, destroy surrounding	Mitigation measures: 1. Wastewater is treated for irrigation: The technologies used for waste water treatment comprise of physical-chemical technology, anaerobic technology, nitration-denitrification and aerobic MBR. The treated waste water will be reused within the project and no effluent will be discharged. 2. Waste resource reuse: The slag will be used for manufacturing building materials. The fly ash will be solidified onsite and disposed of in nearby landfill specially constructed for fly ash. 3, The use of noise reduction equipment and biological noise reduction measures: through the sound insulation of the workshop, and equipment shock and noise reduction, planting plants as insulation and other measures, the project noise in accordance with the relevant noise emission standards to minimize the impact of noise on the surrounding environment, to ensure that the operation of the project on the surrounding biodiversity minimization. Measures like enclosed transportation and storage of manure, greening of

	natural habitats and ecosystems, and negatively affect the survival and reproduction of wild animals and plants.	project site and application of deodorant will be taken to reduce odor pollution. These are no wild animals and plants at project site. 4. Implement ecological compensation measures, such as planting local vegetation to restore ecosystems, protecting habitats, and building ecological corridors to compensate for the impact on biodiversity.
Soil degradation and soil erosion	No risk identified	The project is a MSW incineration and power generation project and will not result in oil degradation and soil erosion.
Water consumption and stress	No risk identified	The project is a MSW incineration and power generation project, and does not need to consume too much water resources except for a small amount of domestic water for employees.
Usage of fertilizers	No risk identified	The project is a MSW incineration and power generation project and has no impact on usage of fertilizers.

2.4.1 Rare, Threatened, and Endangered species

The project is not located in or near the habitat of rare, threatened or endangered animals, according to the official websites of national and local environmental authorities and nature conservation agencies.

2.4.2 Introduction of species

Not applicable as this table is not required for projects with no planting or species introduction.

2.4.3 Ecosystem conversion

Not applicable as the project is not an ARR, ALM, WRC or ACoGS project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0022	Alternative waste treatment processes	03.0
Tool	02	Combined tool to identify the baseline scenario and demonstrate additionality	07.0
Tool	03	Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion	03.0
Tool	04	Emissions from solid waste disposal sites	08.0
Tool	05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0
Tool	07	Tool to calculate the emission factor for an electricity system	07.0
Tool	08	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	03.0
Tool	24	Common practice	03.1
Tool	27	Investment analysis	12.0

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
ACM0022	The methodology applies to project activities that install and operate new plants for the treatment of fresh waste through any combination of the following processes: (a) Composting process under aerobic conditions; (b) Anaerobic digestion with biogas recovery and flaring and/or its use; (c) Co-composting of wastewater in combination with solid waste;	Applicable. The project incinerates fresh waste and generate electricity with the waste heat from incineration process. Therefore, the project is applicable to process (g). For the condition (h): (i) In accordance with the FSR, the project only treats fresh waste and only fresh waste for which emission reductions are claimed. (j) According to FSR of the project,

	(d) Anaerobic co-treatment of wastewater in combination with solid waste; (e) Mechanical/thermal treatment process to produce refuse-derived fuel (RDF) or stabilized biomass (SB) that is produced within the project boundary and its use; (f) Gasification process to produce syngas and its use; (g) Incineration of fresh waste for the generation of thermal/electric energy. (h) The following conditions apply to all project activities using this methodology: (i) The project plant only treats fresh waste/wastewater for which emission reductions are claimed, except for cases involving composting, co-composting and anaerobic digestion; (j) Neither the fresh waste nor the products from the project plant are stored on-site under anaerobic conditions; (k) Any wastewater discharge resulting from the project activity is treated in accordance with applicable regulations; (l) The project activity does not reduce the amount of waste that would be recycled in the absence of the project activity. This shall be justified and documented in the clean development mechanism project design document (VCS-PD);	the MSW will be stored for no longer than 7 days before incineration. The crane will convey and mix the waste to avoid anaerobic decomposition. Moreover, the extracted air from the MSW tanker is used as combustion air of the incinerators. The generated cinder will be used for production of construction material while the fly ash will be disposed at landfill sites. The cinder and fly ash will not be stored on-site under anaerobic conditions. Thus, neither the fresh waste nor the products from the project plant will be stored on-site under anaerobic conditions. (k) Any wastewater will be treated within the project boundary by wastewater treatment facility of the project. According to the EIA and EIA approval, waste water treated in the onsite wastewater treatment station could meet the requirements of “Municipal sewage recycling - Industrial water quality” (GB/T19923-2005), and other waste water could meet the requirement of “Municipal sewage recycling - Industrial water quality” (GB/T19923-2005) and “Municipal sewage regeneration and utilization of municipal miscellaneous water quality” (GB/T18920-2002) after treatment. And all the wastewater after treatment is reused. (l) Prior to implementation of the project, the fresh waste was

	(m) When applicable regulations mandate any waste treatment process implemented under the project activity, the rate of compliance with such regulations for the treatment process is below 50 per cent; (n) Hazardous wastes/wastewater are not eligible under this methodology.	disposed at nearby landfill sites. And the recyclable components of the MSW are all recycled before sending to the project. Therefore, the project will not reduce the amount of waste that would be recycled in the absence of the project activity. (m) According to Article 45 of the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes[4] and other provisions, the local government should make overall arrangements for the construction of urban and rural domestic waste treatment facilities. The relevant provisions do not specify specific treatment methods for MSW. Therefore, there are no applicable laws or regulations in China that require incineration of fresh waste at present. Landfill is still the common disposal method at the time of project decision in Shanxi Province where the project located. (n) In accordance with the FSR, the project treats fresh waste which is municipal solid waste and not hazardous wastes or wastewater. Therefore, condition (n) is applicable.
	The methodology is only applicable if the baseline scenario is: (a) The disposal of the fresh waste in a SWDS with or without a partial LFG capture system (M2 or M3);	Applicable. The project incinerates fresh waste and uses the waste heat from incineration process for power generation. The fresh waste was disposed of at nearby landfill sites.

[4] https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml

	(b) In the case of co-composting or co-treatment of wastewater in an anaerobic digester, the treatment of organic wastewater in either an existing or new anaerobic lagoon or sludge pit without methane recovery (W1 or W4); (c) In the case of electricity generation, the electricity is generated in an existing/new captive fossil fuel fired power-only plant, captive cogeneration plant and/or the grid (P2, P4 or P6); (d) In the case of heat generation, the heat is generated in an existing/new fossil fuel fired cogeneration plant, boiler or air heater (H2 or H4).	The most plausible baseline scenario is (a) the disposal of the fresh waste in a SWDS without LFG capture system (M3) and (c) electricity generation in existing and/or new grid-connected electricity plants (P6). As per FSR of the project, the project does not involve co-composting or co-treatment of wastewater in an anaerobic digester.
	Specific applicability conditions for the different processes are provided in Table 2 of ACM0022 (Version 03.0). Applicable types of wastes that may be treated：Fresh waste; Applicable products and their use: Electricity and/or heat Applicable waste by-products: Incineration byproduct (e.g. inert materials); Wastewater discharge; Non-biodegradable materials that may have market value (i.e. glass, metals and plastics) Specific applicability conditions: Incineration technology is rotary kiln, rotating fluidized bed, circulating fluidized bed, hearth or	Applicable. The project incinerates fresh waste and generate electricity with the waste heat from incineration process. The cinder generated will be used for production of construction material while the fly ash will be disposed at landfill sites. Wastewater will be treated and reused within the project. There are no non-biodegradable materials generated. The project applies mechanical grate incinerators and the fraction of energy generated by auxiliary fossil fuels is not more than 50% of the total energy generated in the incinerator[5].

[5] As per FSR of the project, the annual consumption of 0# light diesel in the project is 46.0t, of which the net calorific value is 42.652 MJ/kg. Thus, the annual heat energy generated by light diesel is 1,962GJ (46,000 × 42.652/1000=1,962GJ. The annual power generation of the project is 97,187.9 MWh, and the corresponding thermal energy=97,187.9 × 10^3 × 3.6/1000=349,876GJ. Therefore, the heat energy generated by the auxiliary fossil fuel is=1,962 /349,846=0.56%<50%.

	grate type; The fraction of energy generated by auxiliary fossil fuels is not more than 50% of the total energy generated in the incinerator	The project installs 2 incinerators with treatment capacity of 400 tons/day each. As per FSR of the project, the annual consumption of 0# light diesel in the project is 46.0t, of which the net calorific value is 42.652 MJ/kg. Thus, the annual heat energy generated by light diesel is 1,962GJ (46,000 × 42.652/1000=1,962GJ. The annual power generation of the project is 97,187.9 MWh, and the corresponding thermal energy=97,187.9 × 10^3 × 3.6/1000=349,876GJ. Therefore, the heat energy generated by the auxiliary fossil fuel is=1,962 /349,846=0.56%<50%. Thus, the project is applicable to the waste treatment option "Incineration" listed in Table 2 of ACM0022 (version 03.0).
Tool 02	The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies. This could include, inter alia, a listing of relevant alternative scenarios that should be considered in Step 1, any relevant types of barriers other than those presented in this tool and guidance on how common practice should be established.	Applicable. The project incinerates fresh waste and generate electricity with the waste heat from incineration process.
TOOL03	This tool provides procedures to	Applicable.

	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 will consume 0# light diesel as auxiliary fuel.
TOOL04	The tool can be used to determine emissions for the following types of applications: (a) 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 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 (VCS-PD). 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); (b) 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	Applicable. The project is in line with application B, that avoids the disposal of waste at a SWDS.

	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.	
Tool 05	If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or	Applicable. The project generates 97,187.9 MWh electricity, of which 77,750.3 MWh will be exported to NCPG annually and the rest is consumed on-site. The project will also consume electricity from the NCPG which the project is connected to when the project operation is not in normal. Thus, Scenario A is applicable.

	(c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.	
	This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	Applicable. Generated electricity of the project is supplied to the NCPG. Thus, Scenario I is applicable.
	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	The project does not involve captive renewable power generation technologies installed to provide electricity.

Tool 07	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).	Applicable The project supplies electricity to a NCPG.
	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 IIa and option IIb. If option IIa 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.	Applicable The emission factor for the project electricity system can be calculated for grid power plants as the project is connected to NCPG.

	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Applicable. The project is connected to NCPG in China which is not an Annex 1 country
	Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	Irrelative as the project does not involve biofuel.
TOOL08	The underlying methodology should specify: (a) The gaseous stream the tool should be applied to; (b) For which greenhouse gases the mass flow should be determined; (c) In which time intervals the flow of the gaseous stream should be measured; and (d) Situations where the simplification offered for calculating the molecular mass of the gaseous stream (equations (3) or (17)) is not valid (such as the gaseous stream is predominantly composed of a gas other than N2).	Applicable. The project applies this tool to: (b) determine the mass flow of methane.
Tool 24	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", or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality.	Applicable. The project activity uses "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0). Thus, the tool is applicable.
	In case the applied approved baseline and monitoring	Applicable. "Combined tool to identify the baseline scenario and demonstrate

	methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.	additionality" (version 07.0) requires that the latest version of the "methodological tool: Common practice" available on the UNFCCC website shall be applied. Thus, the tool is applicable.
Tool 27	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.	Applicable. The project applies "Combined tool to identify the baseline scenario and demonstrate additionality" which use investment analysis for the demonstration of additionality and the identification of the baseline scenario. Thus, the tool is applicable.
	In case the applied approved baseline and monitoring methodology contains requirements for the investment analysis that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.	Applicable. The methodology ACM0022 (Version 03.0) does not contain requirements for the investment analysis that are different from those described in this methodological tool. Thus, the tool is applicable.

3.3 Project Boundary

According to the methodology ACM0022 (Version 03.0), project boundary of the project includes the facilities for processing the waste, on-site electricity generation and/or consumption, onsite fuel use, wastewater treatment plant and the landfill site. The project boundary does not include facilities for waste collection, sorting and transport to the project

site. Since the project exports electricity to the NCPG and consume electricity from NCPG, the project boundary also includes those plants connected to the NCPG[6].

The project boundary is show in figure 3-1.

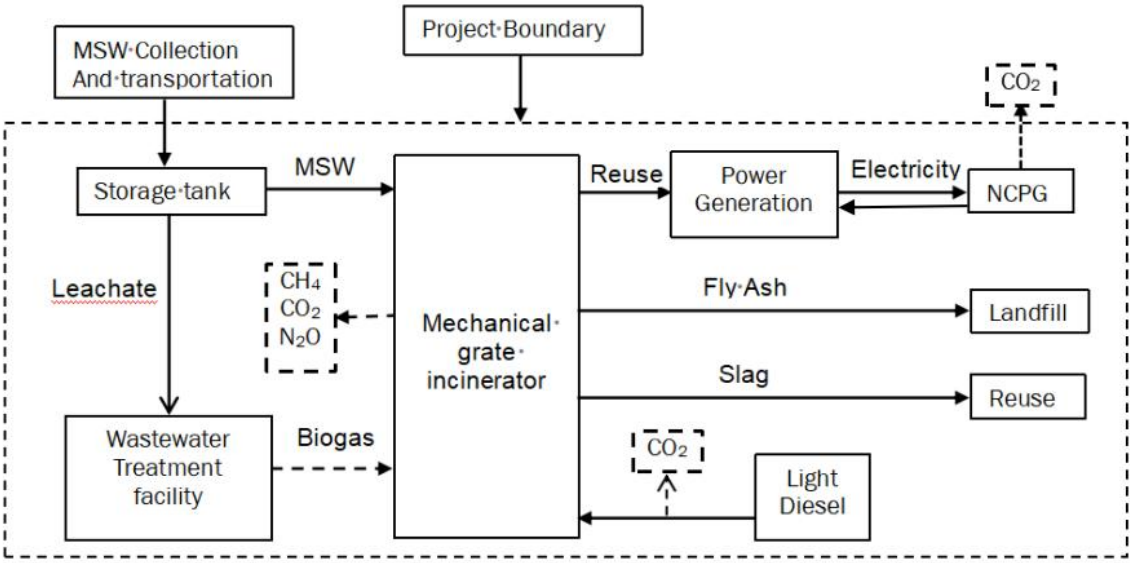


Figure 3-1 Project boundary

The GHG emission sources included in or excluded from the project boundary are listed in Table 3-2.

Table 3-2: Emission sources included in or excluded from the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emissions from decomposition of waste at the SWDS	CH_4	Yes	The major source of emissions in the baseline
		N_2O	No	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative
		CO_2	No	CO_2 emissions from the decomposition of fresh waste are not accounted
	Emissions from anaerobic lagoons or sludge pits	CO_2	No	CO_2 emissions from the decomposition of fresh waste are not accounted for
		CH_4	No	Baseline scenario is waste disposal in SWDS, not in anaerobic lagoons or sludge pits, therefore the emissions of CH_4 is excluded
		N_2O	No	Baseline scenario is waste disposal in SWDS, not in anaerobic lagoons or sludge pits, therefore the

[6] "2021 Baseline Emission Factors for Regional Power Grids in China" which is the latest available data

https://ccer.cets.org.cn/notice/noticeDetail?bulletinInfoId=1175122354980917248

Source		Gas	Included?	Justification/Explanation
				emissions of N_2O is excluded
	Emissions from electricity generation	CO_2	Yes	The project activity generates electricity and supply to the national grid displacing fossil fuel fired electricity generation in the grid
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
	Emissions from use of natural gas	CO_2	No	The project does not involve supply of upgraded biogas through a natural gas distribution network
		CH_4	No	The project does not involve supply of upgraded biogas through a natural gas distribution network
		N_2O	No	The project does not involve supply of upgraded biogas through a natural gas distribution network
Project	Emissions from on-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Yes	Minor emission source, light diesel will be used as auxiliary fuel in incinerator
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small
	Emissions from on-site electricity use	CO_2	Yes	Major emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small
	Emissions from the waste treatment processes	CO_2	Yes	CO_2 emissions from incineration shall be included.
		CH_4	Yes	CH_4 leakage from the anaerobic digester and incomplete combustion in the flaring process are potential sources of project emissions. CH_4 may be emitted from incineration
		N_2O	Yes	N_2O may be emitted from incineration
	Emissions from wastewater treatment	CO_2	No	CO_2 emissions from the decomposition of fresh waste are not accounted
		CH_4	Yes	CH_4 emissions from anaerobic treatment of wastewater are accounted for. It is included in the calculation of $PE_{INC,y}$. Aerobic treatment of wastewater shall not result in CH_4 emissions
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small

3.4 Baseline Scenario

According to the approved methodology ACM0022 (Version 03.0), procedure for the selection of the most plausible baseline scenario and demonstration of additionality is as follows according to the "Combined tool to identify the baseline scenario and demonstrate additionality".

Step 1: Identification of alternative scenarios

This Step serves to identify all alternative scenarios to the project activity which can be the baseline scenario.

Step 1a: Define alternative scenarios to the project activity

For the treatment of the fresh waste, the following alternatives or combinations of these alternatives shall, inter alia, be considered according to ACM0022 (Version 03.0):

Alternative scenarios provided by methodology ACM0022 (Version 03.0)		Realistic and credible?	Justification/explanation
M1	The project activity without being registered as a CDM project activity (i.e. any (combination) of the waste treatment processes listed in Table 2)	Yes	Incineration treatment adopted by the project is one of the methods for fresh waste treatment in China, Therefore, M1 is a feasible baseline scenario.
M2	Disposal of the fresh waste in a SWDS with a partial capture of the LFG and flaring of the captured LFG	No	The national mandatory standard (GB16889-2008) is applicable for LFG disposal, and the related requirements are: 5.15: LFG utilization or torch combustion facilities need to be constructed for MSW landfill site with designed total MSW treatment mount of greater than 2.5 million t and designed thickness of exceeds 20m. For MSW landfills smaller than the above-mentioned scale shall adopt process which can effectively reduce the methane emissions or construct torch combustion facilities to treat methane landfill gas. 9.2.2: Methane emission reduction measures should be adopted at the landfill site; and when the gas

			conducting pipe is directly discharged by the gas guide pipe, the volumetric fraction of the methane in the air conductor discharge port must not greater than 5%. As per information from PP, the total MSW treatment amount of Linfen MSW landfill site is 1.78 million t which is smaller than 2.5 million t and the designed thickness is 10 meters which is lower than 20 meters. And the Linfen MSW landfill site is still in use. Although China government encouraged the collection and utilization of LFG from landfill in the past few years, due to financial and technological difficulties, most of the landfills just release LFG directly into the atmosphere without any recovery and flaring system. As per published Article "Gas generation and collection and utilization in landfill" in 2015[7], most landfills in China are not equipped with gas collection devices, and the technology level is low, thus a large amount of gas is discharged in disorder. As there is no public data of LFG collection or utilization projects in China or Shanxi Province, according to "2019 Statistical Yearbook of Urban and Rural Construction", there were 1,885[8] sanitary landfills in cities and

[7] https://jz.docin.com/p-1652165491.html

[8] 2020 Statistical Yearbook of Urban and Rural Construction, there are 1227 sanitary landfill in counties and 644 sanitary landfill in cities

https://www.mohurd.gov.cn/gongkai/fdzdgknr/sjfb/tjxx/jstjnj/index.html

			counties across China, and only 216[9] biogas power generation projects were installed and connected to the grid. The occupying rate of landfill gas power plants are below 11.46% (11.46%=216/1885). Therefore, it is obvious that LFG gas flaring or utilization is still exceptional and that under common practice conditions the LFG is not mandated to be flared in China in baseline conditions at the time of project decision. Therefore, it is justifiable to conclude that the specific requirements on LFG recovery and utilization as prescribed in the above mentioned regulations have not been systematically enforced and that non-compliance with those requirements, namely uncontrolled emission of LFG to the atmosphere without any recovery and utilization, has been and is still widespread in China. Therefore, M2 is not a realistic and credible alternative scenario.
M3	Disposal of the fresh waste in a SWDS without a LFG capture system	Yes	As justified above, uncontrolled emission of LFG to the atmosphere without any recovery and utilization, has been and is still widespread in China. Therefore, M3 is a realistic and credible alternative scenario.
M4	Part of the fresh fraction of the solid waste is recycled and not disposed in the SWDS	No	As justified above and according to the FSR, landfill is the most common disposal method for domestic waste including fresh waste currently. According to the statistics of the Ministry of Housing and Urban Rural

[9] https://mp.weixin.qq.com/s/dAF6oD4lzgr55n5sWjzqdQ

			Development, the proportion of domestic waste which is disposed of at landfill site in the year when the project was decided to be constructed (2019) is about 76%. Therefore, M4 is not a realistic and credible alternative scenario.
M5	Part of the fresh fraction of the solid waste is treated aerobically and not disposed in the SWDS	No	As justified above and according to the FSR, prior to the implementation of the project activity, the fresh waste was disposed of at nearby landfill site and the relevant report of China Environmental Protection Industry Association pointed out that in recent years, the composting treatment of urban domestic waste continued to show a stagnant or even shrinking state, but the treatment effect was difficult to meet the expected requirements. Moreover, according to "2020 Statistical Yearbook of Urban and Rural Construction"[10], the total number of harmless treatment plants/grounds in Shanxi province is 109, the total number of sanitary landfill plants and incineration plants is 106, and the total number of other plants is 3, which shows that aerobically treat of MSW is not quite mature and recognized technology. Therefore, even all the other plants belong to aerobically treated plants, the rate is 2.75%. In addition, there is no aerobically treatment facility at the location of the project. Therefore, M5 is not a realistic and credible alternative scenario.

[10] https://www.mohurd.gov.cn/gongkai/fdzdgknr/sjfb/tjxx/jstjnj/index.html

M6	Part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS	No	As justified above, landfill and incineration are the mainstream disposal methods, and it is not mandated by the laws or regulations that MSW has to be disposed by either method. Prior to the implementation of the project activity, there is no incineration plant at project area and the fresh waste was disposed of at nearby landfill. Therefore, M6 is not a realistic and credible alternative scenario.
M7	Part of the organic fraction of the solid waste is gasified and not disposed in the SWDS	No	As justified above and according to the FSR, prior to the implementation of the project activity, the fresh waste was disposed of at nearby landfill and therefore, there is no such facilities for gasification of organic fraction of the solid waste. Therefore, M7 is not a realistic and credible alternative scenario.
M8	Part of the organic fraction of the solid waste is treated in an anaerobic digester and not disposed in the SWDS	No	As justified above and according to the FSR, prior to the implementation of the project activity, the fresh waste was disposed of at nearby landfill and therefore, there is no such facilities for anaerobic digestion of organic fraction of the solid waste. Therefore, the alternative M8 is not the realistic alternative scenario to the project activity.
M9	Part of the organic fraction of the solid waste is mechanically or thermally treated to produce RDF/SB and not disposed in the SWDS	No	As justified above and according to the FSR, prior to the implementation of the project activity, the fresh waste was disposed of at nearby landfill and there is no such facility at the location of the project. Therefore, M9 is not a realistic and

			credible alternative scenario.

For electricity generation the following alternatives or combinations of these alternatives, inter alia, shall be considered according to ACM0022 (Version 03.0):

Alternative scenarios provided by methodology ACM0022 (Version 03.0)		Realistic and credible?	Justification/explanation
P1	Electricity generated as an output of one of the waste treatment processes listed in Table 1, not undertaken as a CDM project activity	Yes	Waste heat from the incineration system will be used for electricity generation, which is encouraged in China. Therefore, P1 is a feasible baseline scenario.
P2	Use of an existing or construction of a new on-site or off-site fossil fuel fired cogeneration plant	No	The project only involves electricity generation, not a cogeneration plant. Thus, P2 is not a realistic and credible alternative scenario.
P3	Existing or new construction of an on-site or off-site renewable based cogeneration plant	No	The project only involves electricity generation, not a cogeneration plant. Thus, P3 is not a realistic and credible alternative scenario.
P4	Existing or new construction of an on-site or off-site fossil fuel fired electricity plant	Yes	The actual situation is electricity generation in existing and/or new grid-connected electricity plants. New construction of an on-site or off-site fossil fuel fired electricity plant is a plausible baseline. Therefore, the project P4 is a feasible baseline.
P5	Existing or new construction of an on-site or off-site renewable based electricity plant	No	Wind, solar photovoltaic, hydropower, biomass and geothermal energy are feasible renewable energy sources that can be applied in NCPG. The wind energy resource-rich areas in Shanxi Province can be generally divided into eastern and western parts, i.e. the central fractured basin as the boundary, the Guanrui Mountains, Luliang Mountains and their surrounding areas in the west, and the Hengshan Mountains, Wutai Mountains, Taihang Mountains, Taiyue Mountains, Zhongtiao

			Mountains and their surrounding areas in the east[11]. According to the FSR, Yaodu District, where the project is located, is located in the Plain Area and does not belong to an area rich in wind energy resources, so the development of wind power projects is not financially attractive because of poor wind energy resources. Photovoltaic resources in Shanxi Province belong to the three types of solar resource areas, that is, areas with poor solar resources, so the development of photovoltaic projects is not financially attractive[12]. After a public information search, there are no hydropower projects in Yaodu District and no plans for hydropower projects. Therefore, the location of this project is not suitable for developing hydropower projects. Biomass energy in China is mainly distributed in the Anhui, Shandong, Jiangsu, Heilongjiang and Hubei[13], and for there is big adjustification[14] that national subsidy is reduced for biomass power plant and the price of biomass fuel is increased quickly these years, which are big difficulties for biomass power plant construction. High-temperature geothermal resource suitable for power generation mainly distributed in southern Tibet, western Sichuan and western Yunnan in China. The geothermal resource in Shanxi are mainly shallow geothermal resources whose

[11] https://news.bjx.com.cn/html/20180518/898636.shtml?security_verify_data=3336302c373230

[12] https://www.bilibili.com/read/cv13268951

[13]https://wenku.baidu.com/view/475ac276940590c69ec3d5bbfd0a79563d1ed413.html?fixfr=OoXDKEm%252BwPnI+IMw3W%252FQ%252F2A%253D%253D&fr=income4-wk_app_search_ctrX-+searchhttps%3A%2F%2Fwenku.baidu.com%2Fview%2F475ac276940590c69ec3d5bbfd0a79563d1ed413.html%3Ffixfr%3DOoXDKEm%252B+wPnIIMw3W%252FQ%252F2A%253D%253D&fr=income4-wk_app_search_ctrX-search&_wkts_=1668666630472

[14] https://www.ndrc.gov.cn/xxgk/zcfb/tz/202108/t20210819_1294018.html?code=&state=123

			temperature are low and not suitable for heating[15]. Thus, there is few high-temperature geothermal resource suitable for power generation in Shanxi. Thus, P5 is not a realistic and credible alternative scenario.
P6	Electricity generation in existing and/or new grid-connected electricity plants	Yes	P6 is the actual situation before start of the project and meets the requirements of national regulations. Therefore, P6 it is a realistic and credible alternative scenario.

Outcome of Step 1a:

M1 and M3 for the treatment of the fresh waste, P1, P4 and P6 for electricity generation are feasible baseline scenarios.

Step 1b: Consistency with mandatory applicable laws and regulations

Alternatives M1 and M3 comply with all the applicable laws and regulations, while M1 is not mandated by the laws and regulations.

According to Article 45 of the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes[16] and other provisions, the local government should make overall arrangements for the construction of urban and rural domestic waste treatment facilities. The relevant provisions do not specify specific treatment methods. Thus, M1 is not mandated by the laws and regulations.

Alternative P1 complies with all the laws and regulations, while it is not mandated by the laws and regulations.

According to the data of statistics of the national power industry in 2023 released by National Energy Administration[17], the annual operation hours of fossil fuel fired electricity plant in 2023 is 4,466 hours, if the fossil fuel fired electricity plant generates the same electricity with the proposed project, the installed capacity is 21.76MW[18]. Thus, alternative P4 is not a plausible

[15] https://ishare.iask.sina.com.cn/f/itkdPtFvGy.html

[16] https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml

[17] https://www.gov.cn/lianbo/bumen/202401/content_6928723.htm

[18] 21.76MW=97,187.9MWh/4466h

baseline scenario as construction of fossil fuel fired electricity plant equal to or less than 135MW is prohibited in China[19].

Alternative P6: Power supply from the NCPG complies with all the laws and regulations. According to the analysis above, the possible combinations of baseline are as follows:

Power supply MSW treatment	M1 The project activity without being registered as a CDM project activity	M3 Disposal of the fresh waste in a SWDS without a LFG capture system
P1 Electricity generated as an output of one of the waste treatment processes listed in Table 1, not undertaken as a CDM project activity	**Combination Option1:** According to the BOT agreement, the local government will guarantee the MSW (fuel source of P1) supply to make the project achieve the expected revenue in the FSR. Thus, the alternative baseline scenarios (P1) have sufficient fuel source. It is possible to implement the project activity without CDM registration; the grid-supplied electricity power is replaced by the MSW power.	**The combination is not applicable**, because the project aims to utilize MSW to generate electricity and replace the electricity from the grid.
P6 Power supply from the NCPG	**The combination is not applicable,** because the project activity aims to utilize MSW to generate electricity and replace the electricity from the grid.	**Combination Option2:** China has the richest coal resources in the world[20], thus, the alternative baseline scenarios (P6) have sufficient fuel source. It is possible to disposal the fresh waste in a SWDS here and import the electricity from the grid.

Therefore, alternative baseline scenarios to this project and comply with the laws and regulations include combination option 1 (M1+P1) and combination option 2 (M3+P6).

Step 2: Barrier analysis

[19] http://www.gov.cn/gongbao/content/2002/content_61480.htm

[20] https://baijiahao.baidu.com/s?id=1738740001416874571&wfr=spider&for=pc

The combined alternative scenario 1 and scenario 2 have no barriers to their implementation in terms of investment and technology, so neither scenario is excluded from the barrier analysis.

Outcome of Step 2

The project is not the first-of-its-kind, and the remaining alternative scenarios include the proposed project activity undertaken without being registered as a VCS project activity, thus, proceed to Step 3: Investment Analysis below.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in an or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

The project is located inside a non-Annex 1 country and is not registered or is in the process of being registered in an Annex I or non-Annex I country to the UNFCC. Project activities are not mandated by any law, statute or other regulatory framework.

There is no legal law and regulation to mandate incineration of MSW in China. only it is encouraged to build the system for MSW classified disposal, collection, transportation and treatment, comprehensive utilization and harmless treatment of MSW by “Regulations of Prevention and Control of Environmental Pollution by Solid Waste in Shanxi Province”, “Law of the People's Republic of China on the Prevention and Control of Solid Waste Pollution” etc, while it is not mandated to treat the MSW with incineration.

Therefore, the project activity is not mandated by any law, statute, or other regulatory framework, it is regulatory surplus.

3.5.2 Additionality Methods

The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The analysis should include all alternative scenarios remaining after Step 2, including scenarios where the project participants do not undertake an investment (M3+P6).

The latest approved version of the Guidelines on the assessment of investment analysis, available on the UNFCCC website, shall be taken into account when applying this step.

After Step1 and Step 2, the combination option 1 (M1+P1) and the combination option 2 (M3+P6) are remaining scenarios. And therefore, the IRR is used as financial indicator in the analysis.

The installed capacity of the project is 15MW in the FSR, in which the project IRR is 6.72%. According to the Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects[21] issued by Operation Department of Power Generation and Transmission, State Power Corporation, and " Economic Evaluation of Construction Projects "Methods and Parameters" issued by National Development and Reform Commission in 2006 and modified on 15/03/2013[22], the financial benchmark IRR of total investment (after tax) applicable to the Waste to Energy projects in China is 8%, and only when the IRR after tax is equal to or higher than the benchmark, then the project can be economically feasible.

Calculation and comparison of financial indicators:

The following parameters and values are applied for the calculation and comparison of the project financial indicator, IRR, with and without carbon reduction revenue.

Table 3-3: Parameters to determine the project IRR

Item	Value	Unit	Source
Waste treatment capacity	313,700	t/a	FSR
Installed generator capacity	15	MW	FSR
Annual average electricity exported to the NCPG	77,750.3	MWh	FSR
Total static investment	56,642.52	10^4CNY	FSR
Electricity tariff (with VAT)[23]	0.65	CNY/Kwh	FSR
Project lifetime	30[24]	Year	FSR
O&M costs	3.019	10^4CNY	FSR
Auxiliary fuel cost (diesel oil)	8,500	CNY/ton	FSR
Fly Ash treatment cost	35	CNY/ton	FSR
Water fee	3.5	CNY/m^3	FSR
Value Added Tax rate for electricity sales, tipping fee, material cost and auxiliary fuel cost, and repair cost	16	%	FSR

[21] http://cdm.unfccc.int/UserManagement/FileStorage/JL694VF0I1STX3G7M3RL8W0TMHVOAR

[22] https://www.ndrc.gov.cn/fggz/gdzctz/tzfg/201907/t20190729_1197578.html

[23] http://www.gov.cn/zwgk/2012-04/10/content_2109921.htm According to "Notice on the Improvement of Electricity Price Policy for MSW Incineration" issued by the National Development and Reform Commission of China on 10 April 2012, feed-in electricity tariff within the line which is 280 kWh/tonne (incl. VAT) is 0.65CNY/kWh, and feed-in electricity tariff out of the line which is 280 kWh/tonne (incl. VAT) is equal to local feed-in electricity tariff for coal power).

[24] The lifetime is 30 years, including 2 years construction time and 28 years of operational time

Value Added Tax rate for water fee	13	%	FSR
Income tax (Operation year 1-3)	0	%	FSR
Income tax (Operation year 4-6)	12.5	%	FSR
Income tax (Operation year 7-28)	25	%	FSR
Urban Maintenance and Construction tax	5	%	FSR
Educational Surtax	5	%	FSR
Load factor	91[25]	%	FSR

The financial analysis for the project is shown in the table below, with and without VCUs taken into account. The calculated IRR value of the project without VCUs would be 6.72%, which is far below the financial benchmark 8%. Thus, without VCUs revenue, this project will face substantially financial hurdles and cannot be implemented. After taking VCUs revenue into consideration, the project's IRR of total investment can reach 8.08%. Therefore, the profitability of proposed project with VCUs revenue was improved hence is more financially attractive to investors. In addition, the project owner attaches great importance to promoting the environmental protection technology, the VCUs revenue can improve the financial attractiveness to some extent and then can affect the project owner and investors affirmatively to promote this project as a global warming mitigation project.

Table 3-4 Financial analysis results of the proposed project

IRR (%)	
Without VCUs	6.72
With VCUs	8.08

A sensitivity analysis is conducted by altering the critical parameters:

- Total Static Investment;
- Annual O&M Cost;
- Feed-in Electricity Tariff;
- Electricity Supplied to NCPG;
- Tipping Fee;
- MSW amount

[25] According to the FSR, the designed MCR point of the incinerator is 8,000 hours. Calculation of Load factor: 8,000/8,760h=91%.

The designed conditions of this project (MCR) is: daily incinerated MSW amount (Amount of leachate which accounts for 20% of the fresh MSW into the plant is deducted) in furnace is 600 tons, and the designed Calorific value of the MSW entered into the furnace is 6,700kJ/kg.

The above parameters are selected as being most likely to fluctuate over time. Financial analysis is performed altering each of the critical parameters mentioned above between -10%~10%, and assessing the impact on the project IRR as shown in the Table 3-5 and Figure 3-2 below.

Table 3-5 Total Investment IRR Sensitivity Analysis

	-10%	-5%	0%	5%	10%
Total Static Investment	8.46%	7.53%	6.50%	6.00%	5.36%
Annual O&M Cost	7.17%	6.94%	6.50%	6.49%	6.26%
Electricity Tariff	6.01%	6.37%	6.50%	7.06%	7.40%
Electricity Supplied to NCPG	6.01%	6.37%	6.50%	7.06%	7.40%
Tipping fee	6.21%	6.46%	6.50%	6.97%	7.22%
MSW Amount	6.29%	6.50%	6.50%	6.93%	7.14%

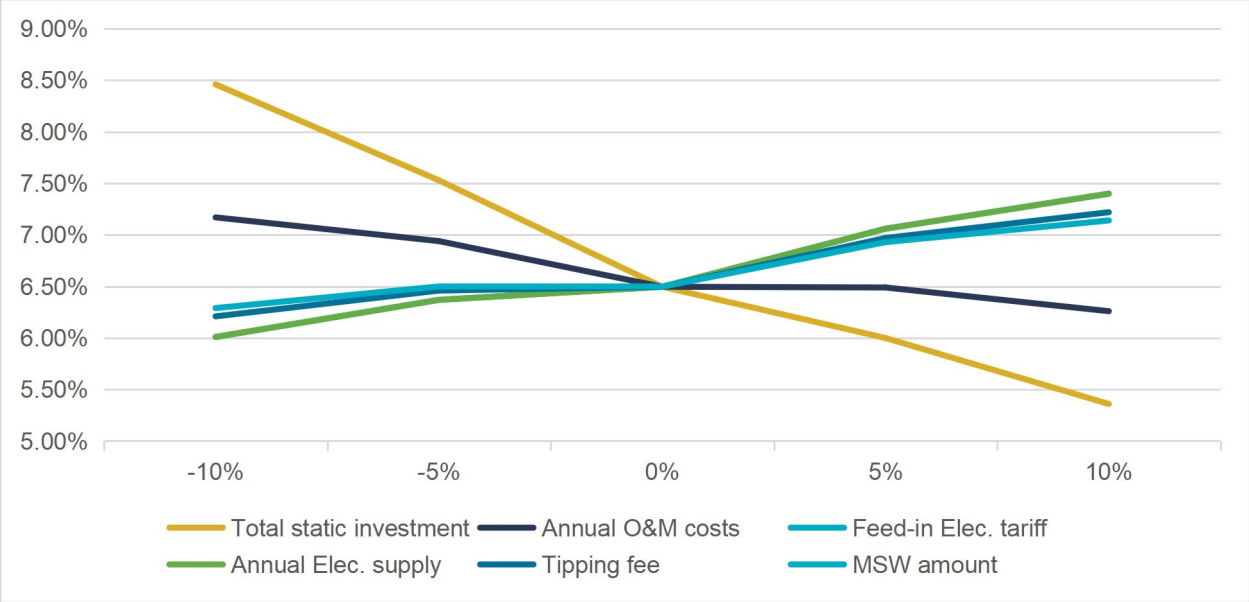


Figure 3-2 Sensitivity Analysis

From table 3-5, it can be seen that when the six critical parameters mentioned above fluctuate between -10%~10%, the IRR are all lower than the benchmark 8%. As justified in the critical point analysis below, the MSW Amount is unlikely to reach the benchmark 8%.

The Critical Point of change of the six major parameters when the Project IRR without VCUs revenue reach the benchmark is as follows：

Table 3-6 Critical Point Analysis with Actual Tariff

Total Static Investment	Annual O&M costs	Feed-in Elec. Tariff	Annual Elec. Supply	Tipping Fee	MSW Amount
-7.6%	-29.0%	+19.0%	+19.0%	+28.7%	+32.5%

Table 3-6 shows the necessary change in the six major parameters required for the Project IRR without VCUs revenue to reach the benchmark rate, ceteris paribus. Significant variation of the above mentioned parameters is unrealistic considering the following:

Total static investment

When IRR reaches the benchmark, the total static investment must be decreased by 7.6%. According to the summary sheet of main contracts of the project summarized in April, 2023, the actual total contract amount has reached 57,881.6 CNY which is higher than the total static investment in FSR. Therefore, the static investment is unlikely to decrease by 7.6%.

Annual O&M Cost

For the IRR to reach the benchmark, the Annual O&M Cost must be decreased by 29.0%. Because the Annual O&M Cost covers necessary disbursements such as material cost, auxiliary fuel cost, the fee for water resource use, maintenance & repair expenses, insurances and payroll&welfare, etc, and the operational fee is increasing. The Consumer Price Index (CPI) was 101.6%, 102.1%, 102.9%, 102.5%, 100.9%, 102,0% in 2017, 2018, 2019, 2020, 2021 and 2022 respectively in China[26]. Therefore, it is unlikely that the operation cost is decreased by 29.0%.

Feed-in Electricity Tariff

When the expected power tariff increases by 19%, the IRR of the proposed Project is nearly equal to the benchmark. However, this scenario is extremely unlikely. The actual Feed-in electricity tariff is 0.65 CNY/kWh in FSR[27] and the actual price is 0.65 CNY/kWh as per the electricity sales contract. Therefore, it is unlikely that the power tariff increases by 19%.

Electricity Supply

When IRR reaches the benchmark, the electricity supply must be increased by 19%.

[26] https://data.stats.gov.cn/easyquery.htm?cn=C01

[27] http://jjs.mof.gov.cn/zhengcefagui/202010/t20201015_3604104.htm According to "Supplementary notice on matters related to the Several Opinions on Promoting the Healthy Development of Non-water Renewable Energy Generation"(No. Caijian [2020] 426 issued by Ministry of Finance of China on September 29, 2020, for biomass power generation project including waste to energy projects, project rational utilization hours in full life cycle which can receive subsidies from the central government is 82500 hours, and after 15 years from the date of grid connection, the biomass power generation project will no longer enjoy the central financial subsidy funds, regardless of whether the project has reached the full life cycle subsidy electricity.

The annual net electricity supplied to the grid can be mainly influenced by MSW amount, the MSW Calorific value and the plant load factor. Since the annual amount of waste delivered to the plant has been engaged through the BOT agreement by the local government, the maximum of the plant disposal capacity is designed accordingly. It is unlikely the amount of waste incinerated will fluctuate significantly.

The capacity of furnace, boiler and generator of the plant is designed carefully to meet the average net (or lower) Calorific value of MSW estimated for 6,700 kJ/kg[28]. The evolution and fluctuation of the calorific value of MSW, based on experience of the largest upper-income cities in China, are already taken into consideration in the calculation of electricity output. The plant load factor and its annual net electricity supplied to the grid are seriously assessed by an independent and highly qualified institute, China Light Industry Xi'an Design & Engineering Co. Ltd.

The plant load factor 91% is determined based on 8,000 h full load hours which are very close to the maximum operation hours of the plant by taking into account the need for a periodical maintenance and the seasonal fluctuations of MSW heating values. According to the analysis of the online monitoring data of China's MSW incineration power plant from the Ministry of Ecology and Environment, the operating hours of China's MSW incineration projects is less than 8,000h[29]. The MSW amount in the FSR of this project is designed at 8,000h, and when IRR reaches the benchmark 8%, the MSW amount disposed at the plant is 373,303 tons[30], and the corresponded operating hours is 9,519 h[31] which exceeds the maximum annual operation hours of the MSW incineration furnace of the proposed project which is 8,000h. In addition, as stated above, the operating hours of China's waste incineration projects is less than 8,000h, the annual operating hours in the 28 operating years for the proposed project is not likely to be 9,519 hours.

Thus, it is hard for electricity supply to increase by 19%.

MSW Amount

When the expected MSW Amount increases by 32.5%, the IRR of the project is nearly equal to the benchmark. However, this scenario is extremely difficult to achieve.

Since the annual MSW amount delivered to the plant has been engaged through the BOT agreement by the local government, the maximum of the plant disposal capacity is designed

[28] Feasibility Study Report

[29] http://www.envirunion.com/newsinfo-25983.html

[30]373,303 =313,700*（1+19%）

[31] 9,519 h=373,303 tonne* (1-15%)*24 h/800 tonne

accordingly, and the growth rate of MSW amount in Linfen city are already taken into account based on statistics data. Meanwhile, in accordance with the analysis above, when IRR reaches the benchmark 8%, the corresponded operating hours is 9,519 h which is bigger than 8760 which is the total number of hours for one year. It is unlikely the amount of waste incinerated will fluctuate significantly.

Therefore, it is extremely difficult for the MSW Amount to increases by 32.5%.

Tipping fee

When IRR reaches the benchmark, the tipping fee shall be increased by 28.7%. According to the concession contract signed by the project owner and local government, the tipping fee is fixed. Therefore, it is unlikely that the tripping fee increases by 28.7%.

To sum up, none of variations can raise the project IRR higher than the benchmark of 8%. In the absence of the VCUs revenue stream, these reasonable variations conducted in the sensitivity analysis do not influence the fact that without VCUs revenue, the IRR is lower than benchmark, and thus the project will not be financially attractive for the project investors or banking loan system in China.

Outcome of Step 3:

The combined scenario M1 & P1 has no financial attractiveness and is not the realistic alternative option. The combined scenario M3 & P6 is the realistic and credible baseline alternative.

Step 4: Common practice analysis

Analysis on common practice of the project is among the same type of projects under operation in Shanxi Province, using the following steps as per the Combined tool to identify the baseline scenario and demonstrate additionality (version 07.0) and Methodological tool-common practice (version 03.1).

Sub-step 4a. Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The total installation capacity of the Project is 15MW and treatment capacity is 800t/d, range of +/- 50% of the capacity is from 7.5 MW to 22.5 MW of installation capacity and 400t/d to 1200t/d of treatment capacity.

Sub-step 4b: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area

China is a large country with vast territory, the different level of development from province to province[32] can lead to differences in technology applications (for example, for MSW disposal method, the choice will be affected by the amount of MSW, as well as the particularities of the waste composition, investment and operation costs (the factor will be affected by such as local labour cost, tax rate, and price of purchasing fuel and power), and local policy (including environmental protection request and financial subsidy), etc. Therefore, based on the similar investment environment, economic policies, regulations related, natural sources, price of purchasing fuel and power, etc., Shanxi Province is chosen as the applicable geographical area for analysis of common practice.

(b) The projects apply the same measure as the proposed project activity

The same measure as the activity is MSW incineration and power generation.

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

The same energy source/fuel and feedstock as the proposed project activity is municipal solid waste.

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

The plants incinerate MSW for methane formation avoidance and power generation with heat from the MSW treatment system to replace equivalent electricity from NCPG.

(e) The capacity or output of the projects is within the applicable output range calculated in Sub-step 4a

The output/capacity range of the projects is from 7.5 MW to 22.5 MW of installation capacity and 400t/d to 1200t/d of treatment capacity.

(f)The projects started commercial operation before the project design document (VCS-PD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

For common practice analysis, the start date should be as per CDM terminology. According to the “Glossary CDM terms”, start date is defined as that “for the CDM project activity, where a contract is signed for such expenditures, it is the date on which the contract is signed. In other cases, it is the date on which such expenditures are incurred. If the CDM project activity or CPA involves more than one of such contracts or incurred expenditures, it is the first of the respective dates.” Therefore, the start date of project is the signing time of the construction

[32] http://www.mof.gov.cn/gkml/caizhengshuju/

contract of Dormitory building, office building and corridor, which is the earliest contract signed for project.

The earliest contract signed date for the project is 15-05-2019. Thus, for the common practice analysis of the project, the applicable commercial operation starting date is before 15-05-2019.

Therefore, the MSW incineration projects with installed capacity 7.5 MW to 22.5 MW and treatment capacity of 400 t/d to 1200 t/d, have started commercial operation before 15-05-2019 in Shanxi Province are chosen for this analysis. Searching from publicly available sources, China's DNA website, Verra website, GS website and UNFCCC website, all similar projects which fulfil all the conditions above are listed below.

No.	Project Name	Type of technology	Treatment capacity (t/d)	Installed Capacity (MW)	Time of commencement of commercial operation	GHG program
1	Fenyang Zhongke Yuanchang MSW Incineration and and Power Generation Project [33]	Circulating Fluidized Bed	500	12	02-07-2014	-
2	Lingshi County MSW Incineration and and Power Generation Project[34]	Circulating Fluidized Bed	500	9	26-11-2010	-

Sub-step 4c: within the projects identified in Sub-step 4b, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

As per the project listed above, there are two projects of the same type listed above, therefore, the N_{all} = 2. Listed as below:

No.	Project Name	Type of technology	Treatment capacity (t/d)	Installed Capacity (MW)	Time of commencement of commercial operation	GHG program
1	Fenyang Zhongke	Circulating	500	12	02-07-2014	-

33 http://nearme.yidianzixun.com/article/0UO2XMpT?s=browser&appid=browser&__publisher_id__=kdc3DnCLuUscpKTSNI1x0g&__docId__=0UO2XMpT

34http://www.lingshi.gov.cn/xwzx/zwdt/content_4714?SessionVerify=e4b74d5d-73e7-499f-8a78-67c58c5273a9

	Yuanchang MSW Incineration and and Power Generation Project[35]	Fluidized Bed				
2	Lingshi County MSW Incineration and and Power Generation Project[36]	Circulating Fluidized Bed	500	9	26-11-2010	-

Sub-step 4d: within similar projects identified in Sub-step 4c, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}

As technology of the two projects listed above applied is the Circulating Fluidized Bed Combustor (CFB) which can burn other fuels like industrial waste biomass and low quality coal, which other incinerator technologies cannot handle (e.g. grate incinerator), and as a result it can enjoy a higher profit from electricity[37]. This is one of the big advantages of CFB combustor.

As analysed above, the two projects listed above have obvious energy sources change than the proposed project, so the N_{diff} is 2.

Sub-step 4e: calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

Since $N_{all}=2$, $N_{diff}=2$, therefore, $N_{all}-N_{diff}=0$, which is less than 3.

Outcome of Step 4:

According to the analysis above, the proposed project activity is not regarded as “common practice” and the project is additional.

3.6 Methodology Deviations

There is no methodology deviations for the project.

35 http://nearme.yidianzixun.com/article/0UO2XMpT?s=browser&appid=browser&__publisher_id__=kdc3DnCLuUscpKTSNI1x0g&__docId__=0UO2XMpT

36 https://www.qcc.com/firm/21deaf3c599c6d52df5a1462fce962f0.html

37 https://www.docin.com/p-831293619.html

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to the ACM0022 (version 03.0), baseline emissions are determined as follows:

$$BE_y = \sum_t \left(BE_{CH4,t,y} + BE_{WW,t,y} + BE_{EN,t,y} + BE_{NG,t,y}\right) \times (1 - RATE_{compliance,t}) \quad (1)$$

Where:

BE_y = Baseline emissions in year y (tCO_2e)

$BE_{CH4,t,y}$ = Baseline emissions of methane from the SWDS in year y (tCO_2e)

$BE_{WW,t,y}$ = Baseline methane emissions from anaerobic treatment of the wastewater in open anaerobic lagoons or of sludge in sludge pits in the absence of the project activity in year y (tCO_2e)

$BE_{EN,t,y}$ = Baseline emissions associated with energy generation in year y (tCO_2)

$BE_{NG,t,y}$ = Baseline emissions associated with natural gas use in year y (tCO_2)

$RATE_{compliance,t}$ = Discount factor to account for the rate of compliance of a regulatory requirement that mandates the use of alternative waste treatment process t [38]

t = Type of alternative waste treatment process

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

For the proposed project activity, the baseline emissions comprise of:

A. Methane emissions from the SWDS in the absence of the project activity; [$BE_{CH4,t,y}$]

[38] Determined once for each crediting period, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation.

B. Energy generated or electricity consumed by the grid in the absence of the project activity; [$BE_{EN,t,y}$]

The other two sources stated above ($BE_{WW,t,y}$ and $BE_{NG,t,y}$) are not applicable.

As there is no local or national environmental regulation or law that mandates the treatment of MSW through incineration in China at present, the compliance rate is determined zero for the crediting period.

Therefore,

$$BE_y=BE_{CH4,y}+BE_{EN,y}$$

4.1.1 Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

Baseline emissions of methane from the SWDS are determined using the methodological tool "Emissions from solid waste disposal sites" (version 08.0). The following guidance should be taken into account when applying the tool:

(a) $W_{j,x}$ in the tool is the amount of organic fresh waste prevented from disposal in the baseline SWDS due to its treatment in any (combination) alternative waste treatment process[39];

(b) Emission amounts are calculated using Application B in the tool (only fresh waste avoided from disposal after the start of the first crediting period shall be considered;

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

(d) The tool instructs that f_y shall be determined based on historic data or contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available). As there is no data or contract or regulation requirements specifying the amount of methane that must be destroyed/used, in accordance with the statements in paragraph 33 of ACM0022 (03.0), the following additional instruction applies:

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

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

[39] In case a combination of treatment processes is implemented in parallel, $W_{j,x}$ is determined for each process.

(iii) If the requirement does not specify any amount or percentage of LFG that should be destroyed but require the installation of a system to capture and flare the LFG, then it is assumed fy = 0.2.[40]

As justified above, mandatory requirements do not specify any amount or percentage of LFG that should be destroyed, and mandatory requirements that require the installation of a system to capture and flare the LFG in certain conditions have not been systematically enforced and non-compliance with those requirements, namely uncontrolled emission of LFG to the atmosphere without any recovery and utilization, has been and is still widespread in China. Therefore f_y=0.

The Baseline emissions of methane from the SWDS in year y ($BE_{CH4,SWDS,y}$) are calculated as per the latest version of the approved methodological tool "Emissions from solid waste disposal sites" considering the following additional equation:

$$BE_{CH4,\,y}=BE_{CH4,\,SWDS\,,\,y}=\varphi_y\times(1\text{-}fy)\times GWP_{CH4}\times(1\text{-}OX)\times\frac{16}{12}\times F\times DOC_{f,y}\times MCF_y\times\sum_{x=1}^{y}\sum_j (W_{j,x}\times DOC_j\times e^{-k_j\times(y-x)}\times(1-e^{-kj})) \quad (2)$$

$BE_{CH4,\,SWDS,\,y}$	=	Baseline methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (t CO_2e/yr)
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_{CH4}	=	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)

[40] Project participants may propose and justify an alternative default value as a request for revision to this methodology.

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
k_j	=	decay rate for the waste type j

Determining the amounts of waste types *j* disposed in the SWDS ($W_{j,x}$ or $W_{j,i}$). Where different waste types *j* are disposed or prevented from disposal in the SWDS (for example, in the case of MSW), it is necessary to determine the amount of different waste types ($W_{j,x}$ or $W_{j,i}$). As for the project, since different waste types are disposed, Application B is selected.

Determining the parameters required to apply the FOD model.

This includes the use of default values or project specific value estimated yearly. The time period in which waste disposal is considered in the calculation is the first credit period (10 years).

Determining the model correction factor (φ_y)

If baseline emissions are being calculated, the project participants may choose between the following two options to calculate φ_y:

Option 1: Use a default value

Option 2: Determine based on specific situation of the project activity.

Option 1 applied, therefore, φ_y=0.80 (Application B: Dry conditions)

Determining the amounts of waste types j disposed in the SWDS ($W_{j,x}$)

Determine the amount of different waste types through sampling and calculate the mean from the samples, as follows:

$$W_{j,x}=W_x \times p_{j,x} \quad (3)$$

Where:

W_x=Total amount of solid waste disposed or prevented from disposal in the SWDS in year x;

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

j=Types of solid waste;

x=Years in the time period from which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y).

The fraction of the waste type j in the waste for the year x are calculated according to the following formula:

$$P_{j,x}=\frac{\sum_{n=1}^{Z_x} P_{n,j,x}}{Z_x} \quad (4)$$

Where:

$P_{j,x}$	=	Average fraction of the waste type j in the waste in year x (weight fraction)
$P_{n,j,x}$	=	Fraction of the waste type j in the sample n collected during the year x (weight fraction)
Z_x	=	Number of samples collected during the year x
n	=	Samples collected in year x
j	=	Types of solid waste
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)

Determining the fraction of DOC that decomposes in the SWDS ($DOC_{f,y}$)

The default value ($DOC_{f,y}=DOC_{f,default}$) is chosen.

Procedures to determine the methane correction factor (MCF_y)

The SWDS is not the condition that a water table above the bottom (such as, using waste to fill inland water bodies, such as ponds, rivers or wetlands), thus a default value ($MCF_y=MCF_{default}$) is used.

4.1.2 Baseline emissions from generation of energy ($BE_{EN,y}$)

This procedure is distinguished depending on whether the baseline is the separate generation of electricity and heat or the combined generation of heat and electricity by cogeneration.

4.1.2.1 Separate generation of electricity and heat

$$BE_{EN,y} = BE_{EC,y} + BE_{HG,y} \quad (5)$$

Where:

$BE_{EN,y}$	=	Baseline emissions associated with energy generation in year y (t CO_2)
$BE_{EC,y}$	=	Baseline emissions associated with electricity generation in year y (t CO_2)

$BE_{HG,y}$ = Baseline emissions associated with heat generation in year y (t CO_2)

The project activity involves electricity generation and no heat generation.

Therefore, $BE_{EN,y}$ is calculated as follows:

$$BE_{EN,y} = BE_{EC,y}$$

4.1.2.1.1 Baseline emissions from separate generation of electricity ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) shall be calculated using "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". When applying the tool:

(a) The electricity sources k in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and

(b) $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated by the alternative waste treatment process t and exported to the grid or displacing fossil fuel fired captive energy plant in year y ($EG_{t,y}$).

As per the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 3.0, Scenario A (Electricity consumption from the grid), Option A1 ($EFE_{L/j/k/l,y}=EF_{grid,CM,y}$) is applicable to be chosen to calculate the combined margin emission factor of the applicable electricity system, using the procedures in the "Tool to calculate the emission factor for an electricity system (version 7.0)".

$$BE_{EC,y}=EG_{t,y}\times EF_{grid,CM,y}\times(1+TDL_{k,y}) \quad (6)$$

Where:

$BE_{EC,y}$	=	Baseline emissions associated with electricity generation in year y (t CO_2)
$EG_{t,y}$	=	Electricity generated by the alternative waste treatment option t and exported to the grid in year y (MWh)
$EF_{grid,CM,y}$	=	Grid power emissions factor in year y (tCO_2/MWh)
$TDL_{K,y}$	=	Average technical transmission and distribution losses for providing electricity to source k in year y
K	=	Sources of electricity consumption in the baseline

According to the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0), the project belongs to the case of Scenario A, use as default values of 3% for baseline emission, i.e, $TDL_{k,y}$=3%.

According to the methodology of ACM0022 and Tool to calculate the emission factor for an electricity system (version 7.0), grid power emission factor is the carbon emission factor of the NCPG.

Grid power emissions factor $EF_{grid,CM,y}$

According to the Tool to calculate the emission factor for an electricity system (version 7.0), calculated with following 6 steps:

STEP 1: Identify the relevant electricity systems;

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

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

STEP 4: Calculate the operating margin emission factor according to the selected method;

STEP 5: Calculate the build margin (BM) emission factor;

STEP 6: Calculate the combined margin (CM) emission factor.

STEP 1. Identify the relevant electricity system

According to the Tool to calculate the emission factor for an electricity system (Version 07.0), project participants may delineate the project electricity system using any of the following options:

Option 1. A delineation of the project electricity system and connected electricity systems published by the DNA or the group of the DNAs of the host country(ies), In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries;

Option 2. A delineation of the project electricity system defined by the dispatch area of the dispatch centre responsible for scheduling and dispatching electricity generated by the project activity. Where the dispatch area is controlled by more than one dispatch centre, i.e. layered dispatch area, the higher level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centres are required to comply with dispatch orders of the national dispatch centre then area controlled by the national dispatch centre shall be used);

Option 3. A delineation of the project electricity system defined by more than one independent dispatch areas, e.g. multi-national power pools.

The Chinese DNA has published a delineation of the project electricity system and connected electricity systems on 17 November 2023[41], Option 1 is applied for the project. According to the delineations, the NCPG is identified as the relevant electric power system of the project, which consists of Beijing Power Grid, Tianjin Power Grid, Hebei Power Grid, Shanxi Power Grid, Shandong Power Grid and Inner Mongolia Power Grid. This delineation is used.

[41] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/t20201229_815386.shtml

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

Project participants 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.

Based on China's real situation, only grid power plants are included 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 the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, Option b and Option c cannot be possibly used for the project. **Option a** is selected to calculate the Operating Margin emission factor of the project.

The Simple OM method (a) can only be applied when low-cost/must run *resources*[42] constitute less than 50% of total grid generation in average of the five most recent years. According to "2021 Baseline Emission Factors for Regional Power Grids in China"[43] which is the latest available data, for the NCPG the project activity connected to, the average low-cost/must-run electric power resources generation accounts for the total grid total in recent five years is lower than 50%, which satisfied the applicability of the method (a), therefore, the simple OM method is chosen for the calculation of the OM emission factor.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

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

[42] Low-cost/must-run (LCMR) resources - are defined as power plants with low marginal generation costs or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If a fossil fuel plant is dispatched independently of the daily or seasonal load of the grid and if this can be demonstrated based on the publicly available data, it should be considered as a low-cost/must-run. Electricity imports shall be treated as one LCMR power plant

[43] https://ccer.cets.org.cn/notice/noticeDetail?bulletinInfoId=1175122354980917248

crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation.

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 emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Here ex-ante vintage is chosen, and the $EF_{grid,OM}$ is fixed during the crediting period.

STEP 4. Calculate the operating margin emission factor according to the selected method

The Simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. The simple OM may be calculated:

- Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit;
- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

For the project activity, the required data for the exercise of Option A is not available. Nevertheless, the total net efficiency generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system are available, and nuclear and renewable power generation are considered as low-cost/must-run power sources and quantity of electricity supplied to the grid by these sources is known, and off-grid power plants are not included in the calculation, therefore, Option B is chosen to calculate the operating margin emission factor:

For Option B, the Simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y} \quad (7)$$

Where：

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y

(tCO_2e/MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2e/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and including electricity imports to the grid. Electricity imports should be treated as one power plant source.

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO2,i,y}$ should be used where available. If no such values are available, IPCC world-wide default values are preferable. The Net Calorific Value ($NCV_{i,y}$) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbook 2018-2020. Emission factors ($EF_{CO2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

On the basis of the data available, the three-year average operating margin emission factor is calculated by the DNA as a full-generation-weighted average of the emission factors: $EF_{grid,OMsimIpe,y}$ = 0.9714 tCO_2e/MWh. Details of the calculations and the published data from the Chinese DNA[44], which uses official national statistics.

Step 5. Calculate the build margin emission factor

In terms of vintages of data, project participants can choose between one of the following two options:

(a) Option 1- For the first crediting period, calculate the build margin emission factor, ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting

[44] https://ccer.cets.org.cn/notice/noticeDetail?bulletinInfoId=1175122354980917248 "2021 Baseline Emission Factors for Regional Power Grids in China"

period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The PD chooses **Option 1**, which requires the project participant to calculate the Build Margin Emission Factor $EF_{grid,BM,y}$, ex-ante based on the most recent information available on units already built for sample group m at the time of PD submission.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\ units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20 percent of AEG_{total} (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\ per\ cent}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\ per\ cent}$, in MWh);

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\ per\ cent}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SETsample started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore Steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprising at least 20 per cent of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore Steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{-}>10yrs}$).

Under the current circumstances in China, the power plants consider the Build Margin data as important business data and will not have them published. Therefore, it is difficult to obtain the data of five power plants that have been put into operation most recently or the newly installed power plant capacity additions in the electricity system that comprise 20% of the system generation.

According to the instructions of China DNA, for the determination of the set of samples, a sample merging processing in some degree has been adopted due to that the power generation data, energy consumption data or thermal efficiency data of each plant cannot be consulted in the public statistical data. In this calculation, the newly-installed power units in the past years are classified by year, province and power generation technology, and the same type of newly installed power units in the same province and in the same year are bundled as a "newly-installed power units".

The power generation of each “newly-installed power units” in the most recent year y is estimated based on its installed capacity and the number of power generation utilization hours in year y.

The formula is as follows:

$$EG_{m,y}=CAP_m \times H_{m,y} \quad (8)$$

Where:

$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
CAP_m	=	Installed capacity of electricity generated and delivered to the grid by power unit m in year y (MW)
$H_{m,y}$	=	The number of power utilization hours (h) of electricity generated and delivered to the grid by power unit m in year y. And it selects the average utilization hours of similar units in the province in which it is located in year

y

Y = Most recent year for which data is available

M = The sample group of power units

The power unit m is selected from the "newly-installed power plants" in the most recent year y (For the calculation of the grid BM in 2021, the y is equal to 2019) to the "newly-installed power plants" in the earlier year, until the cumulative power generation reaches 20% of the total power generation in the year y (y=2019).

Since the newly-installed power units of the same type (k) in the same province (A) and the same year (t) are bundled into the "newly-installed power units", the CAP_m is equal to the statistical data of recent installed capacity of a given unit type(k) in a given year(t) in a given province (A).

$$CAP_m = CAP_m \mid m=(A,t,k) = CAP_{A,t,k} \quad (9)$$

As per tool, the CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the tool in Step 4 section 6.4.1 for the simple OM, using Options A1, A2 or A3, using for y the most recent historical year for which electricity generation data is available, and using form the power units included in the build margin.

Because current statistics data cannot separate each power plant, for a power unit m, only data on electricity generation and the fuel types used is available. So, the option A2 is selected, the emission factor should be determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (10)$$

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type i used in power unit m in year y (tCO_2/GJ)

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (ratio)

3.6 = Conversion coefficient of thermal work equivalent of electricity (GJ/MWh)

According to formula (10), the unit electricity emission factor of the hydro-power, nuclear power, wind power, solar power, other thermal power[45] , and others power generation technology[46] in the "newly-installed power units" samples are is zero. The emission factor per unit of electricity for power generation from coal, gas, oil and and waste power is calculated based on formula

[45] Other thermal power mainly refers to waste heat and pressure, straw, bagasse and forest power generation.

[46] Others power generation technology mainly refers to geothermal energy, ocean energy and other power generation.

(10). Since the average net energy conversion efficiency of each sample ($\eta_{m,y}$) cannot be obtained, the power supply thermal efficiency of the best commercialized technology of coal, gas, oil and waste power ($\eta_{Best,m,y}$) is used which is conservative.

According to the "Tool to calculate the emission factor for an electricity system", the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as the generation-weighted average emission factor(tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available. The calculation equation is as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (11)$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2e/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2e/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can't be separated from the existing statistical data, the following measures are taken for the calculation:

First, based on the available data of the latest year, determine the ratio of CO_2 emissions from coal, oil, and gas consumption for power generation to the total CO_2 emission; Second, to calculate the emission factor of the thermal power based on the weight of CO_2 emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20 per cent of the newly added capacity.

Sub-step 5.1. Calculation of weights of CO_2 emission of solid, liquid and gaseous fossil fuels in total emissions for power generation

$$\lambda_{Coal,y} = \frac{\sum_{i \in Coal,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (12)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in Oil,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (13)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in Gas,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (14)$$

Where:

$FC_{i,j,y}$	=	Amount of fossil fuel type i consumed in province j in year y (mass or volume unit)

$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ/t or GJ/m^3)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2e/GJ)

Coal, Oil and Gas refer to the group of solid, liquid, and gaseous fossil fuels, respectively.

Sub-step 5.2. Calculation of Emission Factor of Relevant Thermal Power

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (15)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ refer to the emission factors representing best technologies commercially available for coal, oil and gas fired power plants, respectively, see detailed parameter and calculation in Annex 2 of "Notification on Determining Baseline Emission Factor of China's Grid in 2021 for details[47].

Sub-step 5.3. Calculate of BM of the grid

Using the share of different type of capacity in total capacity addition as weight, the weighted average of emission factors of different type capacity is calculated as the Build Margin emission factor $EF_{grid,BM,y}$ of the NCPG.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (16)$$

Where：

$CAP_{Total,y}$ = The total newly added electricity generation capacity (MW);

$CAP_{Thermal,y}$ = The newly added electricity generation capacity of thermal power (MW)

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2018-2020. The potential emission factors are sourced from "2006 IPCC Guidelines for National Greenhouse Gas Inventories" Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.

The BM emission factor ($EF_{grid,BM,y}$) of the NCPG is calculated to be 0.4701 tCO_2e/MWh, which is the same as the one in the Notification on Determining Baseline Emission Factor of China's Grid in 2021(renewed on 17-November-2023, see Annex 2 of "Notification on Determining Baseline Emission Factor of China's Grid in 2021 for details[48]).

[47] https://ccer.cets.org.cn/notice/noticeDetail?bulletinInfoId=1175122354980917248

[48]https://ccer.cets.org.cn/notice/noticeDetail?bulletinInfoId=1175122354980917248

Step 6. Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (17)$$

Where：

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor for the project electricity system in year y(tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor for the project electricity system in year y(tCO_2/MWh)

ω_{OM} =Weighting of operating margin emissions factor (%)

ω_{BM} = Weighting of build margin emissions factor (%)

The combined margin emissions factor $EF_{grid,CM,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$), where ω_{OM}= 0.5 and ω_{BM} = 0.5 for the first crediting period, and ω_{OM} = 0.25 and ω_{BM} = 0.75 for the second and third crediting period.

For the project, the weight ω_{OM} and ω_{BM} are both 0.5 by default for the fixed crediting period. And the ($EF_{grid,OM,y}$) and ($EF_{grid,BM,y}$) are calculated as described in Step 4 and 5.

$EF_{grid,CM,y}$ = 0.9714 tCO_2e/MWh *0.5+0.4701 tCO_2e/MWh *0.5 = 0.72075 (tCO_2e/MWh)

4.2 Project Emissions

As per the Methodology ACM0022 (version 03.0) the project emissions in year y are:

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

Where:

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

$PE_{INC,y}$ = Project emissions from incineration in year y (t CO_2e)

Since the project activity involves incineration of the MSW, so the parameter $PE_{INC,\ y}$ is applicable for calculation of project emissions and other parameters are not included.

$$PE_y = PE_{INC,y}$$

4.2.1 Project emissions from incineration ($PE_{INC,y}$)

According to methodology ACM0022, project emissions from incineration include emissions from combustion within the project boundary ($PE_{COM,INC,y}$). If associated with the incineration process, then project emissions shall also account for electricity consumption, fossil fuel consumption and wastewater treatment (if associated with the incineration process). Project emissions are therefore determined as follows:

$$PE_{INC,y} = PE_{COM,INC,y} + PE_{EC,INC,y} + PE_{FC,INC,y} + PE_{ww,INC,y} \quad (19)$$

Where:

$PE_{INC,y}$ = Project emissions from incineration in year y (t CO_2e)

$PE_{COM,INC,y}$ = Project emissions from combustion within the project boundary of fossil waste associated with incineration in year y (tCO_2)

$PE_{EC,INC,y}$ = Project emissions from electricity consumption associated with incineration year y (tCO_2e)

$PE_{FC,INC,y}$ = Project emissions from fossil fuel consumption associated with incineration in year y (tCO_2e)

$PE_{ww,INC,y}$ = Project emissions from the wastewater treatment associated with incineration in year y (tCH_4)

$PE_{EC,INC,y}$ is determined according to the procedure "Project emissions from electricity use", where $PE_{EC,INC,y}=PE_{EC,t,y}$ and the alternative waste treatment option t is incineration. The electricity generated by onsite incineration may be excluded.

$PE_{COM,INC,y}$ is determined according to the procedure "Project emissions from combustion within the project boundary", where $PE_{INC,COM,y}=PE_{COM,t,y}$ and the combustor c is the incinerator.

$PE_{FC,INC,y}$ is determined according to the procedure "Project emissions from fossil fuel use", where $PE_{FC,INC,y}=PE_{FC,t,y}$ and the alternative waste treatment option t is incineration.

$PE_{ww,INC,y}$ is determined according to the procedure "Project emissions from wastewater treatment", where $PE_{ww,INC,y}=PE_{ww,t,y}$ and the alternative waste treatment option t is incineration.

4.2.1.1 Project emissions from electricity use *($PE_{EC,t,y}$)*

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

(a) Project emissions shall be calculated for the sources of electricity consumed due to the alternative waste treatment process t, excluding consumption of electricity that was generated by the project activity ($EC_{t,y}$);

(b) If the project activity consists of more than one alternative waste treatment process, then project participants may choose to monitor electricity consumption for the entire site and then allocate this consumption to one of the different alternative waste treatment processes (e.g. apportionment based on sub-metering data is not required).

$$PE_{EC,t,y} = \sum_{j} EC_{t,y} \times EF_{grid,CM,y} \times (1 + TDL_{j,y}) \qquad (20)$$

Where:

$PE_{EC,t,y}$	=	Project emissions from electricity consumption due to waste treatment process t implemented under the project activity in year y (t CO_2/yr)
$EC_{t,y}$	=	Electricity consumed generated from the grid as a result of the alternative waste treatment option t in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Grid power emissions factor in year y (t CO_2/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y (Default value of 20% provided by the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" is applied)
j	=	Sources of electricity consumption in the project

In normal condition, part of the generated electricity will be consumed on-site and the rest will be supplied to NCPG. When the equipment is under repair or in emergency, the project will consume electricity from NCPG. As the project will consume electricity generated on-site, and for ex ante calculation, $EC_{t,y}$ =0. For ex post calculation, the electricity consumption will be based on the actual monitored data.

As analyzed above, $EF_{grid,CM,y}$=0.72075 tCO_2/MWh.

$PE_{EC,t,y}$=0×0.72075×(1+20%)=0.

4.2.1.2 Project emissions from fossil fuel use *($PE_{FC,t,y}$)*

The project emissions from fossil fuel combustion associated with waste treatment process t implemented under the project activity ($PE_{FC,t,y}$) shall be calculated using "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". When applying the tool:

Processes j in the tool correspond to the sources of fossil fuel consumption due to the alternative waste treatment process, other than for electricity generation. Consumption sources shall include, as relevant, fossil fuels used for starting the gasifier, auxiliary fossil fuels for operating the incinerator, heat generation for mechanical/thermal treatment process and on-site fossil fuel combustion during co-firing with waste. Fossil fuels used as part of the on-site processing or management of feedstocks and by-products shall also be included;

If the project activity consists of more than one alternative waste treatment process, then project participants may choose to monitor fossil fuel consumption for the entire site and then allocate consumption to one of the different alternative waste treatment processes.

$$PE_{FC,t,y}=\sum_i FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,y} \quad (21)$$

Where:

$PE_{FC,j,y}$ = Project emissions from fossil fuel combustion associated with waste treatment process t implemented under the project activity in year y(tCO_2)

$FC_{i,j,y}$ = Quantity of fuel type i combusted in process *j* during the year y (kg)

$NCV_{i,y}$ = The weighted average net calorific value of the fuel type i in year y (MJ/kg)

$EF_{CO2,i,y}$ = The weighted average CO_2 emission factor of the fuel type i in year y (tCO_2/MJ)

4.2.1.3 Project emissions from combustion within the project boundary ($PE_{COM,c,y}$)

This procedure estimates emissions from gasifiers, incinerators, RDF/SB combustors and syngas burners ($PE_{COM,c,y}$). The procedure is not relevant for flares or biogas combustors. Emissions consist of carbon dioxide, and small amounts of methane and nitrous oxide, as follows:

$$PE_{COM,C,y} = PE_{COM,CO2,c,y} + PE_{COM,CH4,N2O,c,y} \quad (22)$$

Where:

$PE_{COM,C,y}$ = Project emissions from combustion within the project boundary associated with combustor c in year y (t CO_2e)

$PE_{COM,CO2,c,y}$ = Project emissions of CO_2 from combustion within the project boundary associated with combustor c in year y (t CO_2)

$PE_{COM,CH4,N2O,c,y}$ = Project emissions of CH_4 and N_2O from combustion within the project boundary associated with combustor c in year y (t CO_2)

c = Combustor used in the project activity: gasifier or syngas burner, incinerator or RDF/SB combustor

4.2.1.3.1 Project emissions of CO_2 from combustion within the project boundary ($PE_{COM,CO2,c,y}$)

Carbon dioxide project emissions associated with on-site combustion ($PE_{COM\_CO2,c,y}$) are calculated based either on the fossil carbon content of the fresh waste or RDF/SB combusted, or on the fossil carbon content of the stack gas. The biogenic carbon content is not considered.

Project participants may select from three options to calculate $PE_{COM\_CO2,c,y}$. Option 1 requires sorting the fresh waste into components of waste type j and then determining the fossil-based carbon content of each waste type j. Option 2 determines the fossil-based carbon content of the unsorted fresh waste or RDF/SB (noting that Option 1, sorting into waste fractions, is not applicable if only RDF/SB is combusted). Option 3 measures directly the fossil-based carbon content of the stack gas.

For gasifiers producing syngas for on-site utilisation, the fossil carbon content is determined and accounted for once, either evaluating the waste composition at the gasifier's inlet (Options 1, 2), or the stack gas at the syngas' stack (Option 3). All the syngas must be combusted.

Option 1 is chosen by the project. Waste sorted into waste type fractions.

$$PE_{COM,CO2,c,y} = EFF_{COM,c,y} \times \frac{44}{12} \times \sum_{j} Q_{j,c,y} \times FCC_{j,y} \times FFC_{j,y} \quad (23)$$

Where:

$PE_{COM,CO2,c,y}$	=	Project emissions of CO_2 from combustion within the project boundary associated with combustor c in year y (t CO_2)
$Q_{j,c,y}$	=	Quantity of fresh waste type j fed into combustor c in year y (t)
$FCC_{j,y}$	=	Fraction of total carbon content in waste type j in year y (t C/t)
$FFC_{j,y}$	=	Fraction of fossil carbon in total carbon content of waste type j in year y (weight fraction)
$EFF_{COM,c,y}$	=	Combustion efficiency of combustor c in year y (fraction)
$\frac{44}{12}$	=	Conversion factor (t CO_2/t C)
c	=	Combustor used in the project activity: gasifier, incinerator or RDF/SB combustor
j	=	Waste type

$FCC_{j,y}$ and $FFC_{j,y}$ are adopted the methodology's defaults from the largest values of the range listed in 2006 IPCC Guidelines. As per 2006 IPCC Guidelines, for waste incinerators it is assumed that the combustion efficiencies are close to 100 percent i.e. $EFF_{COM,c,y}$ is equal to 100%.

For $Q_{j,c,y}$ project participants select to monitor the total waste fed to the combustor and sample the waste to determine the fraction of waste type j as per the following equation:

$$Q_{j,c,y} = \mathrm{Q}_{\mathrm{waste,c,y}} \times \frac{\sum_{n=1}^{Z_y} P_{n,j,y}}{Z_y} \qquad (24)$$

$\mathrm{Q_{j,c,y}}$ = Quantity of waste type j fed into combustor c in year y (t)

$\mathrm{Q_{waste,c,y}}$ = Quantity of fresh waste or RDF/SB fed into combustor c in year y (t)

$\mathrm{P_{n,j,y}}$ = Fraction of waste type j in the sample n collected during the year y (weight fraction)

$\mathrm{Z_y}$ = Number of samples collected during the year y

n = Samples collected in year y

j = Waste type

For data of $\mathrm{P_{n,j,y}}$ (Fraction of waste type j in the sample n collected during the year y (weight fraction) is not available in FSR, thus default value of dry matter content in % of wet weight from IPCC 2006 is applied for ex-ante calculation of $Q_{j,c,\,y}$ (Quantity of waste type j fed into combustor c in year y (t))

4.2.1.3.2 Project emissions of CH_4 and N_2O from combustion within the project boundary (*$PE_{COM,CH4,N2O,c,y}$*)

Emissions of N_2O and CH_4 from combustion of RDF/SB are neglected because they are considered very minor. For the case of gasification or incineration, project participants may choose either Option 1 or Option 2 to estimate emissions of N_2O and CH_4 from combustion within the project boundary.

Option 1 calculates the emissions based on monitoring the N_2O and CH_4 content in the stack gas. Option 2 calculates the emissions using default emission factors for the amount of N_2O and CH_4 emitted per tonne of fresh waste combusted.

Option 2 is chosen by the project. Using default emission factors

$$\mathrm{PE_{COM\_CH4,N2O,c,y}} = \mathrm{Q_{waste,c,y}} \times (\mathrm{EF_{N2O,t}} \times \mathrm{GWP_{N2O}} + \mathrm{EF_{CH4,t}} \times \mathrm{GWP_{CH4}}) \quad (25)$$

Where:

$\mathrm{PE_{COM\_CH4,N2O,c,y}}$ = Project emissions of CH_4 and N_2O from combustion within the project boundary associated with combustor c in year y (t CO_2)

$\mathrm{Q_{waste,c,y}}$ = Quantity of fresh waste or RDF/SB fed into combustor c in year y (t)

$\mathrm{EF_{N2O,t}}$ = Emission factor for N_2O associated with waste treatment process t (t N_2O/t waste)

$\mathrm{EF_{CH4,t}}$ = Emission factor for CH_4 associated with treatment process t (t CH_4/t waste)

$\mathrm{GWP_{N2O}}$ = Global Warming Potential of nitrous oxide (t CO_2e/t N_2O)

$\mathrm{GWP_{CH4}}$ = Global Warming Potential of methane valid for the commitment

period (t CO_2e/t CH_4)

c = Combustor used in the project activity: gasifier, incinerator

t = Type of alternative waste treatment processes: gasification, incineration

4.2.1.4 Emissions from run-off wastewater management ($PE_{ww,t,y}$)

As per the methodology, if the project activity generates wastewater discharge that is treated anaerobically (through other than in an anaerobic digester that is part of the project activity), stored anaerobically or released without further treatment in accordance with applicable regulations, then project participants shall determine $PE_{ww,t,y}$ with three equations distinguished for the situation that there is either complete, partial or no flaring/combustion of the methane generated by the run-off wastewater treatment process.

(a) For cases without flaring/combustion of the methane generated by the wastewater discharge:

$$\mathrm{PE_{ww,t,y}} = \mathrm{Q_{ww,y}} \times \mathrm{P_{COD,y}} \times \mathrm{B_0} \times \mathrm{MCF_{ww}} \times \mathrm{GWP_{CH4}} \quad (26)$$

(b) For cases with partial flaring/combustion of the methane generated by the wastewater discharge:

$$\mathrm{PE_{ww,t,y}} = \mathrm{Q_{ww,y}} \times \mathrm{P_{COD,y}} \times \mathrm{B_0} \times \mathrm{MCF_{ww}} \times \mathrm{GWP_{CH4}} + (PE_{flare,ww,y} - F_{CH4,flare,y} \times GWP_{CH4}) \quad (27)$$

(c) For cases with complete flaring/combustion of the methane generated by the wastewater discharge:

$$PE_{ww,t,y} = \frac{PE_{flare,ww,y}}{GWP_{CH4}} \quad (28)$$

Where:

$\mathrm{PE_{ww,t,y}}$ = Project emissions of methane from wastewater discharge associated with alternative waste treatment process t in year y (t CO_2e)

$\mathrm{Q_{ww,y}}$ = Amount of wastewater discharge generated by the project activity and treated anaerobically or released untreated from the project activity in year y (m^3)

$\mathrm{P_{COD,y}}$ = COD of the wastewater discharge generated by the project activity in year y (tCOD/m^3)

$\mathrm{B_0}$ = Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand (t CH_4/tCOD)

$\mathrm{MCF_{ww}}$ = Methane conversion factor (fraction)

GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (t CO_2e/t CH_4)

$PE_{flare,ww,y}$ = Emissions from flaring associated with wastewater discharge treatment in year y (t CO_2e)

$F_{CH4,flare,y}$ = Amount of methane in the wastewater treatment gas that is sent to the flare/combustor in year y (t CO_2e)

All wastewater of the project, which include landfill leachate, flushing wastewater, cooling tower circulating wastewater, boiler wastewater, laboratory wastewater, and domestic wastewater, will be treated through wastewater treatment facility at the wastewater treatment station. And the biogas by anaerobically treated wastewater will be sent to the incinerator to be flared.

According to the ACM0022 (version 03.0), the project selects the Option 2 to estimate the resulting methane emissions from flaring. And the project should assume a 90 per cent destruction efficiency of the methane contained in the gas, $\eta_{flare,h}$ = 0.9, and emissions calculated as follows:

$$PE_{ww,t,y} = Q_{ww,y} \times P_{COD,y} \times B_0 \times MCF_{ww} \times GWP_{CH4} \times (1-\eta_{flare,h}) \quad (29)$$

4.3 Leakage Emissions

According to the methodology ACM0022, leakage emissions are associated with composting/co- composting, anaerobic digestion and the use of RDF/SB that is exported outside the project boundary. For the case that waste by-products of the alternative waste treatment options are:

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

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

The project is the incineration of fresh MSW, not involved the process of above. The wastewater generated by the project will be reused as cooling water of the project while it meets the standard of "The reuse of urban recycling water —Water quality standard for industrial uses" (GB/T 19923- 2005) after the treatment. The incineration residues are sent to landfill site. No by-products involved in the project.

Thus, the leakage of the project is zero, LE_y=0.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

follows:

$$ER_y = BE_y - PE_y - LE_y \quad (30)$$

Where,

ER_y = the emission reductions in year y (tCO_2)

BE_y = the emissions in the baseline scenario in year y (tCO_2)

PE_y= the emissions in the project scenario in year y (tCO_2)

LE_y = the leakage in year y (tCO_2)

Calculation of baseline emissions （BE_y）:

According the FSR, the total amount of waste disposed in the proposed project (W_x) is 313,700t per year, and the average fraction of the waste type j in the waste in year x ($p_{j,x}$) can be derived from the test report for the MSW to be disposed. The parameters not monitored in the calculation are shown as below:

Data and default value apply to waste					
Parameters	$\varphi_{default}$	F	DOC_j	K_j	f_y
Value	0.80	0.5	See Table below	See Table below	0
Parameters	$DOC_{f,y}$	OX	MCF_y	GWP_{CH4}	
Value	0.5	0.1	1.0	28	

Waste type j	Percentage content of waste j* (%, wet)	$W_{j,x}$	DOC_j(wet)	k_j
Wood and wood products	9.66	30,303.42	0.43	0.02
Pulp, paper and cardboard	8.72	27,354.64	0.40	0.04
Food, food waste, beverage and tobacco	50.9	159,673.3	0.15	0.06
Textiles	1.6	5,019.2	0.24	0.04
Garden, yard and park waste	22.45	70,425.65	0.20	0.05
Glass	1.32	4,140.84	0	0
metal	0.23	721.51	0	0
plastic	0.52	1,631.24	0	0

rubber	1.64	5,144.68	0	0
other inert waste	2.96	9,285.52	0	0
	Note: According to information available on the Internet, the mean annual temperature(MAT) of Linfen city is 12.2℃ and the mean annual precipitation(MAP) is about 500-620 mm, and the potential evapotranspiration(PET) is 900-1200 mm[49]. Thus, MAP/PET＜1. Based on the data above, Linfen City has a dry climate in the north temperate zone (MAT＜20 ℃), and the value of k_j for this climate is applied for the project.			

Table 4-1 Methane generation from the landfill in the absence of the project activity(tCO_2e/a)

Year	$BE_{CH4,y}$ (tCO_2e)
14-06-2022 – 31-12-2022	10,421
01-01-2023 – 31-12-2023	28,832
01-01-2024 – 31-12-2024	46,339
01-01-2025 – 31-12-2025	62,989
01-01-2026 – 31-12-2026	78,826
01-01-2027 – 31-12-2027	93,892
01-01-2028 – 31-12-2028	108,227
01-01-2029 – 13-06-2029	51,457
Total	480,983

For Baseline Emission Calculation, The two procedures which are 4.1.1 Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) and 4.1.2.1.1 Baseline emissions from separate generation of electricity ($BE_{EC,y}$) are applicable for the proposed project activity.

$BE_{EC,y}=EG_{t,y}\times EF_{grid,CM,y}\times(1+TDL_{k,y})=77,750.3\times0.72075\times(1+3\%)=57,720\ tCO_2/y$

The baseline emission from the proposed project is calculated as following:

Table 4-2 Baseline emission from the proposed project

Year	$BE_{CH4,y}$	$BE_{EC,y}$	$BE_{,y}$

[49] http://old.linfen.gov.cn/contents/256/47150.html

	(tCO_2e)	(tCO_2e)	(tCO_2e)
14-06-2022 – 31-12-2022	10,421	31,785	31,703
01-01-2023 – 31-12-2023	28,832	57,720	67,478
01-01-2024 – 31-12-2024	46,339	57,720	84,985
01-01-2025 – 31-12-2025	62,989	57,720	101,635
01-01-2026 – 31-12-2026	78,826	57,720	117,472
01-01-2027 – 31-12-2027	93,892	57,720	132,538
01-01-2028 – 31-12-2028	108,227	57,720	146,873
01-01-2029 –16-06-2029	51,457	25,934	68,821
Total	480,983	404,038	751,505

Calculation of project emissions （PE_y）:

As the project will consume electricity generated on-site, and for ex ante calculation, $EC_{t,y}$ =0. For ex post calculation, the electricity consumption will be based on the actual monitored data.

As analyzed above, $EF_{grid,CM,y}$=0.72075 tCO_2/MWh.

$PE_{EC,t,y}$=0×0.72075×(1+20%)=0.

The auxiliary fossil fuel applied in the proposed project is diesel oil. Local values are preferred as defaults for net calorific values and CO_2 emission factor. If local values are not available, IPCC default values may be used. The value of $NCV_{i,y}$ in calculation is 42.652×10^{-3} GJ/kg[50] according to China Energy Statistical Yearbook 2018; the value of $EF_{CO2,i,y}$ is 74.8×10^{-3} [51] tCO_2/GJ according to IPCC 2006 Guidelines.

According to the FSR, $FC_{i,t,y}$=4,600kg/a

Therefore, $PE_{FC,t,y}$=130,300×42.652×72.6×10^{-6}=142 tCO_2/a.

Waste type j	Waste proportion (wet basis)(%)	Dry matter content in % of wet weight*(%)	$Q_{j,c,y}$ (t)	$FCC_{j,y}$ (dry, %)	$FFC_{j,y}$ (dry, %)
Wood and wood products	9.66	85	25,758	54	0

[50] China Energy Statistical Yearbook 2018

[51] IPCC 2006 Guidelines

Pulp, paper and cardboard	8.72	90	24,619	50	5
Food, food waste, beverage and tobacco	50.9	40	63,869	50	0
Textiles	1.6	80	4,015	50	50
Garden, yard and park waste	22.45	40	28,170	0	0
Glass	1.32	100	4,141	0	0
metal	0.23	100	722	85	100
plastic	0.52	100	1,631	67	20
rubber	1.64	84	4,322	5	100
other inert waste	2.96	40	8,357	0	0
Total	100	-	165,604	-	-
*Note: Source of dry matter content in % of wet weight: IPCC 2006, V5, Ch2, Table 2.4					

Thus, $PE_{COM,CO2,c,y}=EFE_{COM,c,y} \times \frac{44}{12} \times \sum_i Q_{j,c,i} \times FCC_{j,y} \times FFC_{j,y}$=14,677 tCO_2. Please refer to ER Calculation sheet for details.

Data	Unit	Value
$Q_{waste,c,y}$	t	185,286.28
$EF_{N2O,t}$	t N_2O/t waste (wet basis)	$1.21\times4.7\times10^{-5}$
$EF_{CH4,t}$	t CH_4/t waste	$1.21\times0.2\times10^{-6}$
GWP_{N2O}	t CO_2e/t N_2O	265
GWP_{CH4}	t CO_2e/t CH_4	28

Thus, $PE_{COM\_CH4,N2O,c,y} = Q_{waste,c,y} \times (EF_{N2O,t} \times GWP_{N2O} + EF_{CH4,t} \times GWP_{CH4})$

=2,497 tCO_2

$PE_{COM,C,y} = PE_{COM,CO2,c,y} + PE_{COM,CH4,N2O,c,y}$=17,174 t CO_2e

$PE_{ww,t,y}$ is ex ante estimated as follows:

Data and default value applying to calculate $PE_{flare,y}$					
$Q_{ww,y}$ (m^3/y)	$P_{COD,y}$ (tCOD/m^3)	B_0 (tCH_4/tCOD)	MCFww (fraction)	η_{flare}	GWP_{CH4} (tCO_2e/t CH_4)

62,740[52]	0.05[53]	0.25	0.8	0.9	28

$PE_{ww,t,y}$=62,740×0.05×0.25×0.8×(1-0.9)×28=1,757 tCO_2e

Table 4-3 Project emission of the proposed project (t CO_2e/a)

Year	$PE_{EC,INC,y}$	$PE_{FC,INC,y}$	$PE_{COM,INC,y}$	$PE_{ww,INC,y}$	PE_y
14-06-2022 – 31-12-2022	0	78	9,457	967	10,503
01-01-2023 – 31-12-2023	0	142	17,174	1,757	19,073
01-01-2024 – 31-12-2024	0	142	17,174	1,757	19,073
01-01-2025 – 31-12-2025	0	142	17,174	1,757	19,073
01-01-2026 – 31-12-2026	0	142	17,174	1,757	19,073
01-01-2027 – 31-12-2027	0	142	17,174	1,757	19,073
01-01-2028 – 31-12-2028	0	142	17,174	1,757	19,073
01-01-2029 – 13-06-2029	0	64	7,716	789	8,570
Total	0	997	120,217	12,297	133,511

Calculation of leakage emissions: （LE_y）

The project is the incineration of fresh MSW, not involved the process of above. The wastewater generated by the project will be reused as cooling water of the project while it meets the standard of "The reuse of urban recycling water —Water quality standard for industrial uses" (GB/T 19923- 2005) after the treatment. The incineration residues are sent to landfill site. No by-products involved in the project.

Thus, the leakage of the project is zero, LE_y=0.

Calculation of net GHG emission reductions:

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
14-06-2022 – 31-12-2022	42,206	10,503	0	31,703

52 The data is sourced from FSR

53 The data is sourced from FSR

01-01-2023 – 31-12-2023	86,551	19,073	0	67,478
01-01-2024 – 31-12-2024	104,058	19,073	0	84,985
01-01-2025 – 31-12-2025	120,708	19,073	0	101,635
01-01-2026 – 31-12-2026	136,545	19,073	0	117,472
01-01-2027 – 31-12-2027	151,611	19,073	0	132,538
01-01-2028 – 31-12-2028	165,946	19,073	0	146,873
01-01-2029 – 13-06-2029	77,391	8,570	0	68,821
Total	885,020	133,511	0	751,505

For projects that are not required to assess permanence risk, complete the table below for the project crediting period:

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCUs (tCO_2e)
14-06-2022 – 31-12-2022	42,206	10,503	0	31,703	0	31,703
01-01-2023 – 31-12-2023	86,551	19,073	0	67,478	0	67,478
01-01-2024 – 31-12-2024	104,058	19,073	0	84,985	0	84,985
01-01-2025 – 31-12-2025	120,708	19,073	0	101,635	0	101,635
01-01-2026 – 31-12-2026	136,545	19,073	0	117,472	0	117,472
01-01-2027 – 31-12-2027	151,611	19,073	0	132,538	0	132,538
01-01-2028 – 31-12-2028	165,946	19,073	0	146,873	0	146,873
01-01-2029 – 13-06-2029	77,391	8,570	0	68,821	0	68,821
Total	885,020	133,511	0	751,505	0	751,505

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$RATE_{compliance,t,y}$
Data unit	Fraction
Description	Rate of compliance with a regulatory requirement to implement the alternative waste treatment t implemented in the project activity
Source of data	Studies and official reports, such as annual reports provided by municipal bodies
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	Studies and official reports, such as annual reports provided by municipal bodies
Purpose of Data	Calculation of baseline emissions
Comments	There is no environmental regulation that mandates the disposal of MSW through incineration in China at present, thus the compliance rate is determined zero

Data / Parameter	φ_y
Data unit	-
Description	Model correction factor to account for the model uncertainties
Source of data	Default value for the model correction factor to account for model uncertainties
Value applied	0.80
Justification of choice of data or description of measurement methods and procedures applied	According to information available on the Internet, the mean annual temperature (MAT) of Linfen city is 12.2℃ and the mean annual precipitation (MAP) is about 500-620 mm, and the potential evapotranspiration (PET) is 900-1200 mm[54]. Thus, MAP/PET＜1, which means the climate where the SWDS located belongs to dry conditions. Meanwhile, as per TOOL04: Emissions from solid waste disposal sites (Version 8.0), the project is in line with application B, that avoids or involves the disposal of waste

[54] http://old.linfen.gov.cn/contents/256/47150.html

	at a SWDS. Thus, the value 0.80 is applied.
Purpose of Data	Calculation of baseline emissions
Comments	-

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	Based on an extensive review of published literature on this subject, including 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	The value for managed landfills is used, as directed by the approved methodological tool "Emissions from solid waste disposal sites"
Purpose of Data	Calculation of baseline emissions
Comments	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2. This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Data / Parameter	F
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	Chapter 3, Volume 5, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Data / Parameter	$DOC_{f,y}$
Data unit	-
Description	Fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	Table 2.4, volume 5, chapter 2, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	Using IPCC 2006 Guidelines for default value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	MCF_y
Data unit	-
Description	Methane correction factor
Source of data	Table 3,1, volume 5, chapter 3, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	1.0
Justification of choice of data or description of measurement methods and procedures applied	The placement of waste at the landfill is controlled, including the following activities: (i) cover material; (ii) mechanical compacting; (iii) levelling of the waste. Therefore, 1.0 for anaerobic managed solid waste disposal sites is recommended by 2006 IPCC Guidelines.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	DOC_j
Data unit	-
Description	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
Source of data	Volume 5, Tables 2.4 and 2.5 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	For MSW, the following values for the different waste types *j* should be applied: Default values for DOC_j

	<table><tr><th>Waste type j</th><th>DOC_j (% wet waste)</th></tr><tr><td>Wood and wood products</td><td>43</td></tr><tr><td>Pulp, paper and cardboard</td><td>40</td></tr><tr><td>Food, food waste, beverages and tobacco</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></table>
Justification of choice of data or description of measurement methods and procedures applied	Using IPCC Guidelines for default value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	k_j
Data unit	1/yr
Description	Decay rate for the waste type *j*
Source of data	Table 3.3, volume 5, chapter 3, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	The following values are applied for the different waste types *j*: Values for the decay rate (k_j) <table><tr><th rowspan="3">Waste type j</th><th>Boreal and Temperate (MAT≤20 °C)</th></tr><tr><th>Dry (MAP/PET <1)</th></tr><tr><th>k_j</th></tr><tr><td>Wood and wood products</td><td>0.02</td></tr><tr><td>Pulp, paper and cardboard</td><td>0.04</td></tr><tr><td>Food, food waste, beverages and tobacco</td><td>0.06</td></tr><tr><td>Textiles</td><td>0.04</td></tr><tr><td>Garden, yard and park waste</td><td>0.05</td></tr><tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr></table>

	Note: MAT – mean annual temperature, MAP – Mean annual precipitation, PET– potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration.
Justification of choice of data or description of measurement methods and procedures applied	According to information available on the Internet, the mean annual temperature (MAT) of Linfen city is 12.2℃ and the mean annual precipitation (MAP) is about 500-620 mm, and the potential evapotranspiration (PET) is 900-1200 mm[55]. Thus, MAP/PET＜1.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	GWP_{CH4}
Data unit	t CO_2e/ t CH_4
Description	Global Warming Potential of methane
Source of data	IPCC Fifth Assessment Report
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	● Calculation of baseline emissions ● Calculation of project emissions
Comments	-

Data / Parameter	GWP_{N2O}
Data unit	t CO_2e/ t N_2O
Description	Global Warming Potential of N_2O
Source of data	IPCC Fifth Assessment Report
Value applied	265
Justification of choice of data or description of	-

[55] http://old.linfen.gov.cn/contents/256/47150.html

measurement methods and procedures applied	
Purpose of Data	● Calculation of baseline emissions ● Calculation of project emissions
Comments	-

Data / Parameter	$EF_{CH4,t}$
Data unit	t CH_4/t waste (wet basis)
Description	Emission factor for CH_4 associated with treatment option t
Source of data	Table 5.3, Chapter 5, Volume 5, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	1.21x $0.2x10^{-6}$
Justification of choice of data or description of measurement methods and procedures applied	Country-specific data are not available. Furthermore, as the type of waste of the project is MSW and its technology belongs to continuous incinerators with stoker, value of 1.21x $0.2x10^{-6}$ is applied.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{N2O,t}$
Data unit	T N_2O/t waste (wet basis)
Description	Emission factor for N_2O associated with treatment option t
Source of data	Table 5.4, Chapter 5, Volume 5, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	1.21x $4.7x10^{-5}$
Justification of choice of data or description of measurement methods and procedures applied	Country-specific data are not available. Furthermore, as the type of waste of the project is MSW and its technology belongs to continuous incinerators, value of 1.21x $4.7x10^{-5}$ is applied.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	B_0
Data unit	tCH_4/tCOD

Description	Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand (t CH_4/tCOD)
Source of data	Table 6.2, chapter 6, volume 5 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.25
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	-

Data / Parameter	$FFC_{j,y}$
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
Value applied	For MSW, the following values for the different waste types *j* are to be applied: Default values* for $FFC_{j,y}$ Waste type j: — Paper/cardboard: 5 Textiles: 50 Food waste: 0 Wood: 0 Garden and Park waste: 0 Nappies: 10 Rubber and Leather: 20 Plastics: 100 Metal: 0 Glass: 0 Other, inert waste: 100 *Note: The methodology's default value is the largest value of the range of Table 2.4/Chapter2/Vol.5/2006 IPCC Guidelines
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions

Comments	-

Data / Parameter	$FCC_{j,y}$
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 for National greenhouse Gas Inventories
Value applied	For MSW the following values for the different waste types j are to be applied **Default values* for $FCC_{j,y}$** *Note: The methodology's default value is the largest value of the range of Table 2.4/Chapter2/Vol.5/2006 IPCC Guidelines (as per FFC_j above)
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions
Comments	-

Waste type *j*	$FCC_{j,y}$
Paper/cardboard	50
Textiles	50
Food waste	50
Wood	54
Garden and Park waste	55
Nappies	90
Rubber and Leather	67
Plastics	85
Metal	0
Glass	0
Other, inert waste	5

Data / Parameter	MCF_{ww}
Data unit	Fraction

Description	Methane conversion factor
Source of data	Table 6A.3 chapter 6, volume 5, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.8
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	η_{falre}
Data unit	Fraction
Description	Destruction efficiency of the methane contained in the gas
Source of data	ACM0022, Version 03.0
Value applied	0.9
Justification of choice of data or description of measurement methods and procedures applied	Option 2 to use default values was selected instead, then assume a 90 per cent destruction efficiency of the methane contained in the gas as per ACM0022, Version 03.0.
Purpose of Data	Calculation of $EG_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Operating margin emission factor for the NCPG
Source of data	"2021 Baseline Emission Factors for Regional Power Grids in China" published by Chinese DNA
Value applied	0.9714
Justification of choice of data or description of measurement methods and procedures applied	-

Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build margin emission factor for NCPG
Source of data	"2021 Baseline Emission Factors for Regional Power Grids in China" published by Chinese DNA
Value applied	0.4701
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	ω_{OM}
Data unit	-
Description	Weighting of operating margin emission factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 07.0)
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	ω_{BM}
Data unit	-
Description	Weighting of build margin emission factor

Source of data	"Tool to calculate the emission factor for an electricity system" (version 07.0)
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	t CO_2/MWh
Description	Combined margin emission factor for the grid in year y
Source of data	Calculated based on data of from Notification on Determining Baseline Emission Factor of China's Grid in 2021
Value applied	0.72075
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to "Tool to calculate the emission factor for an electricity system"
Purpose of Data	● Calculation of baseline emissions ● Calculation of project emissions
Comments	Calculated and fixed for the crediting period

5.2 Data and Parameters Monitored

Data / Parameter	$FC_{i,j,y}$
Data unit	kg
Description	Quantity of fuel type i combusted in process j during the year y Diesel and other fossil fuels (if existing) consumption
Source of data	Onsite measurement
Description of measurement methods and procedures to be applied	The data can be acquired from the operation log of the project, and can be double checked according to the purchase invoice.
Frequency of monitoring/recording	Continuously measured

Value applied	4,600 (ex ante estimated)
Monitoring equipment	Mass or volume meters
QA/QC procedures to be applied	Consumed fuel can be confirmed by checking the fuel purchase invoice. The fuel procured is measured by weighbridge at the project site before use. Weighbridge will be checked and regularly maintained in accordance with manufacturer's technical specifications and requirements.
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$Q_{waste,c,y}$
Data unit	tons
Description	Quantity of fresh waste fed into combustor c in year y
Source of data	Weighbridge
Description of measurement methods and procedures to be applied	Measured by weighbridge continuously, aggregated at least annually
Frequency of monitoring/recording	Weighbridge continuously, aggregated at least annually
Value applied	185,286.28 (ex ante estimated)
Monitoring equipment	Weighbridge
QA/QC procedures to be applied	In order to ensure the accuracy, weighbridge will be checked and regularly maintained in accordance with manufacturer's technical specifications and requirements.
Purpose of data	● Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	W_x
Data unit	tons
Description	Total amount of solid waste disposed or prevented from disposal in the SWDS in year x

Source of data	Weighbridge
Description of measurement methods and procedures to be applied	Measured by weighbridge continuously on wet basis, aggregated at least annually
Frequency of monitoring/recording	Weighbridge continuously, aggregated at least annually
Value applied	313,700 (ex ante estimated)
Monitoring equipment	Weighbridge
QA/QC procedures to be applied	In order to ensure the accuracy, weighbridge will be checked and regularly maintained in accordance with manufacturer's technical specifications and requirements.
Purpose of data	● Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$P_{n,j,x}/P_{n,j,y}$
Data unit	Weight fraction
Description	Fraction of waste type j in the sample n collected during the year y Fraction of waste type j in the sample n collected during the year x
Source of data	Sample measurements by project participant
Description of measurement methods and procedures to be applied	Sample the waste composition, using the waste types j, as provided in the table for DOC_j and k_j, and weigh each waste fraction (measured on wet basis)
Frequency of monitoring/recording	A minimum of three samples shall be undertaken every three months with the mean value valid for year y

<table>
<tr><td>Value applied</td><td>Data in FSR are applied
<table><tr><td>Waste Composition (%)</td><td></td></tr><tr><td>Wood and wood products</td><td>8.56</td></tr><tr><td>Pulp, paper and cardboard</td><td>13.72</td></tr><tr><td>Food, food waste, beverage and tobacco</td><td>44.3</td></tr><tr><td>Textiles</td><td>3.5</td></tr><tr><td>Garden, yard and park waste</td><td>16.45</td></tr><tr><td>Glass</td><td>0.32</td></tr><tr><td>metal</td><td>0.23</td></tr><tr><td>plastic</td><td>4.34</td></tr><tr><td>rubber</td><td>4.52</td></tr><tr><td>total</td><td>100.00</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>Electronic weigher</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Sample measurement will be carried out according to the national standard such as MSW sampling and physical analyze method (CJ/T 3039). Minimum of three samples every three months will be collected. Data will be archived during the crediting period and two years after by means of electronic and paper backup.</td></tr>
<tr><td>Purpose of data</td><td>● Calculation of baseline emissions
● Calculation of project emissions</td></tr>
<tr><td>Calculation method</td><td>Analyze and test by the third-party testing agency</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Data / Parameter	Z_x/Z_y
Data unit	-
Description	Number of samples collected during the year x Number of samples collected during the year y
Source of data	Project participants
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Continuously, aggregated annually
Value applied	-

Monitoring equipment	-
QA/QC procedures to be applied	The sample size and sampling technique must ensure the sample is representative.
Purpose of data	● Calculation of baseline emissions ● Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$EFF_{com,c,y}$
Data unit	Fraction
Description	Combustion efficiency of combustor c in year y
Source of data	Default values in Section 5.4.1.3, Chapter 5, Volume 5, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories is used because country or project specific data are not available
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	100
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/kg
Description	The net calorific value (energy content) per mass unit of 0# Light diesel which is used in the project

Source of data	China Energy Statistical Yearbook 2020
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	42.652×10^{-3}
Monitoring equipment	The data is obtained from the China Energy Statistical Yearbook and is reliable.
QA/QC procedures to be applied	-
Purpose of data	● Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$EF_{CO2,i,y}$
Data unit	tCO_2/GJ
Description	CO_2 emission factor per unit of energy of 0# Light diesel which is used in the project
Source of data	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
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	72.6×10^{-3}
Monitoring equipment	The data is obtained from the China Energy Statistical Yearbook and is reliable.
QA/QC procedures to be applied	-
Purpose of data	● Calculation of project emissions

Calculation method	-
Comments	-

Data / Parameter	$EG_{INC,FF,y}$
Data unit	GJ
Description	Energy generated by auxiliary fossil fuel added in the incinerator
Source of data	Project site
Description of measurement methods and procedures to be applied	This parameter will be estimated multiplying the amount of auxiliary fossil fuel added in the incinerator to the net calorific value of this auxiliary fossil fuel
Frequency of monitoring/recording	Annually
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	The amount of auxiliary fossil will be cross-checked with the receipts.
Purpose of data	-
Calculation method	-
Comments	This parameter will be used to assess that the fraction of energy generated by fossil fuel is no more than 50 per cent of the total energy generated in the incinerator. $EG_{INC,FF,y} < 0.50 x (HG_{INC,y} + EG_{INC,y})$

Data / Parameter	$EC_{t,y}$
Data unit	MWh
Description	Amount of electricity consumed from the grid as a result of the project activity during the year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Electricity consumption shall be monitored for all activities included in the project boundary associated with the treatment option
Frequency of	Continuously monitored

monitoring/recording	
Value applied	0
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The accuracy of electricity meter should not be less than 0.5S, and the meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked against invoices when available
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$EG_{t,y}$
Data unit	MWh
Description	Electricity generated by the alternative waste treatment option t and exported to the grid in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Measured continuous; adjusted power meter is monitored successively by grid company.
Frequency of monitoring/recording	Continuously
Value applied	77,750.3
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The accuracy of electricity meter should not be less than 0.5S, and the meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$TDL_{k,y}/TDL_{j,y}$

Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source *j,k* in year y
Source of data	Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation version 03.0
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	-
Value applied	$TDL_{k,y}$=3% $TDL_{j,y}$=20%
Monitoring equipment	As electricity generation of the project is supplied to NCPG which belongs to scenario A of tool 05. Accurate and reliable data is not available within the host country. Therefore the default value from the tool is used.
QA/QC procedures to be applied	-
Purpose of data	• $TDL_{k,y}$ = 3% for Calculation of baseline emissions • $TDL_{j,y}$=20% for Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$Q_{ww,y}$
Data unit	m^3
Description	Amount of run-off wastewater generated by the project activity and treated anaerobically or released untreated from the project activity in year y
Source of data	Measured value by flow meter
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Monthly, aggregated annually
Value applied	62,740 (ex ante estimated)

Monitoring equipment	Flow meter
QA/QC procedures to be applied	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$P_{COD,y}$
Data unit	t COD/m^3
Description	COD of the run-off wastewater generated by the project activity in year y
Source of data	Measured value by purity meter or COD meter
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Monthly and averaged annually
Value applied	0.05 (ex ante estimated)
Monitoring equipment	COD meter
QA/QC procedures to be applied	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

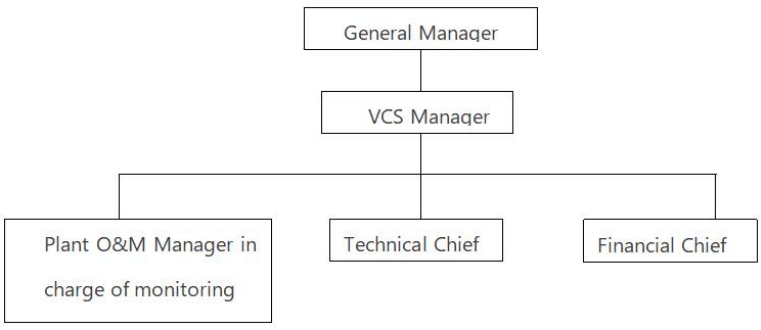
Data / Parameter	f_y
Data unit	Fraction
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the

	amount captured. As justified in 4.1.1, in accordance with the statements in paragraph 33 of ACM0022 (03.0), mandatory requirements does not specify any amount or percentage of LFG that should be destroyed, and mandatory requirements that require the installation of a system to capture and flare the LFG in certain conditions have not been systematically enforced and non-compliance with those requirements, namely uncontrolled emission of LFG to the atmosphere without any recovery and utilization, has been and is still widespread in China. Therefore fy=0.
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	0
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

This Monitoring Plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the proposed project are controlled and reported. This requires an on-going monitoring of the project to ensure performance according to its design and that claimed VCUs are achieved.

1. Monitoring Management



The General Manager of the Project Entity will appoint a VCS project manager or a chief officer. The operational and monitoring(O&M) manager of the plant, the Financial Chief, and the Technical Chief are responsible for the collection of the data and information required in the monitoring plan. The project will perfect the whole monitoring procedure, tracking information from the primary source to the end-data calculations in paper document format. And the internal audit will be conducted in accordance with the monitoring procedure.

The responsibilities of the project staff are as follows:

General Manager: To be responsible for overseeing the whole monitoring procedure and confirm the monitoring, calculation data and reports.

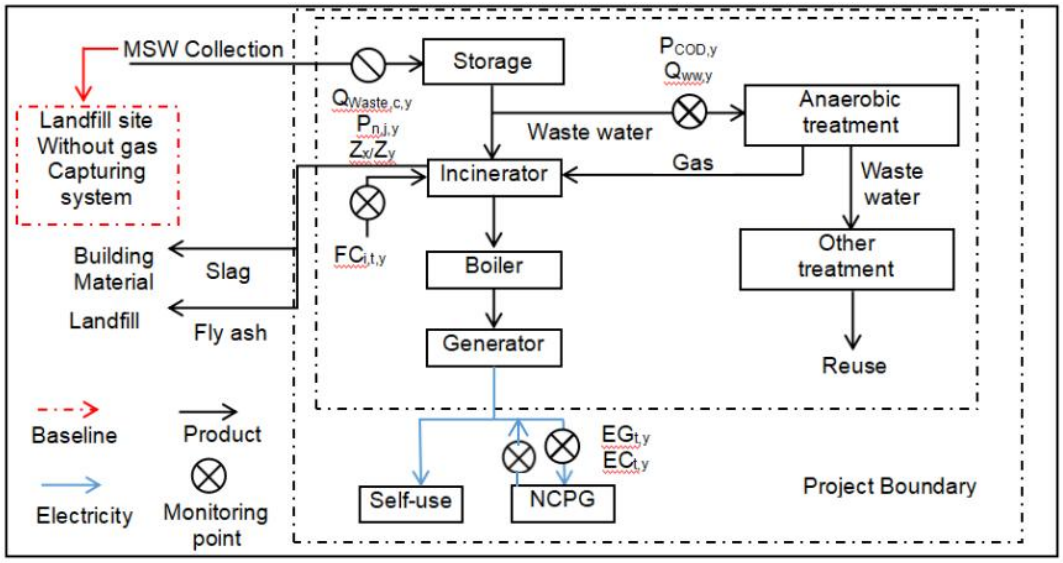
VCS project manager: To be responsible for data management and compiling monitoring report.

O&M Manager in charge of monitoring: To be responsible for collecting data and do internal audit.

Financial chief: To be responsible for collection of sales receipts.

Technical chief: To be responsible for preparing operational reports of the project activity, recording the daily operation of the project, including operating periods, equipment defects, etc.

2. Data to be monitored



The data to be monitored include MSW composition and quantity, electricity exported to the NCPG, auxiliary fuel, COD value and amount of the run-off wastewater generated, etc.

(i) MSW composition will be analyzed in accordance with the national or industry standards. A minimum of three samples every three months with the mean value valid for year y shall be undertaken.

(ii) The amount of waste to be incinerated will be measured and recorded automatically and continuously when each waste truck enters the incineration plant through the truck weighing

machine installed at the gate. The data will be aggregated monthly and annually. The MSW treatment income receipt will be provided for cross check.

(iii) Electricity delivered to local power grid by the project will be recorded by the electricity meter. Copies of receipts or invoices will be provided to the VVB for cross check.

(iv) The grid electricity consumed by the project will be monitored using the electricity meter. Copies of purchase receipts or invoices will be provided to the VVB by the project participant for cross reference.

(v) The type and quantity of auxiliary fuel consumption will be monitored through liquid level gauge and cross checked with the fuel purchase invoices.

(vi) The amount of the run-off wastewater generated will be monitored by flow meter, COD of the run-off wastewater will be measured by purity meter or COD meter. The methane generated from waste water treatment system will be sent to incinerator for combustion.

3. Installation and calibration of the monitoring equipment

The main monitoring equipment includes weighing machine, electricity meters, flow meters and purity meter/COD meter.

The weighing machine will be installed at the entrance of the plant. The accuracy, installation and calibration of the weighing machine should be consistent with national or industry regulations and standards. The weighing machine will record the weight of each waste truck going in and out of the plant. The difference between the two data provides the amount of the waste to be incinerated. The project owner will be responsible for the operation and maintenance of the weighing machine in accordance with manufacturer's technical specifications and requirements. The weighing machine will be calibrated at least once for two years.

The net electricity delivered to and imported from the power grid shall be metered through the electricity meters. The installation of the electricity meter should under the control of the grid company. The metering equipment will be properly installed and calibrated at least once a year according to Technical administrative code of electric energy metering (DL/T448-2016). The grid company will be responsible for the operation and maintenance of the metering device.

The flow meter for monitoring amount of the run-off wastewater will be installed at the inlet of the anaerobic wastewater treatment plant and will be subject to regular maintenance and testing to ensure accuracy. COD of the waste water will be measured by lab sampling test complying with industry standard "Water quality Determination of the chemical oxygen demand-Dichromate method (HJ 828)". The methane generated from waste water treatment system will be sent to incinerator for combustion.

4. QA&QC

All metering equipment for monitoring will be chosen in accordance with VCS requirements and will be calibrated regularly for accuracy by qualified party according to the national regulations. 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 fulfill the requirements of the relevant national standard. The accuracy of the electricity meter is not lower than 0.5S. The accuracy of flow meters, weighing machine, and purity meter/COD meter will fulfill the relevant national standard. All the monitoring equipment will be checked and maintained periodically. All monitoring equipment will be calibrated regularly for accuracy by the qualified party according to the national regulations.

5. Method of dealing with abnormity or errors

If the truck scale and electricity metering system are inaccurate by more than the allowable error, or have otherwise functioned improperly, the monitoring process should be:

(i)Carried out according to the relevant terms in the MSW treatment contract and electricity sales and purchase contract. For the electricity meter, if the fault of the main meter exceeds the allowable tolerance or its malfunction occurs, the grid-connected electricity generated by the proposed project will be resolved by following measures: I Adopting the backup meter's data, unless a test by either party reveals it is inaccuracy; II If the inaccuracy of the backup meter is not within the acceptable limits or it cannot work properly, the project owner and the grid company shall jointly prepare a new agreement regarding the values of electricity exported to and imported from the grid by the proposed project.

(ii)The conservative data will be used to calculate the emission reductions achieved by the project during this period.

(iii)If the error data could not be calibrated and validated, the emission reductions achieved from these error data should not be claimed.

6. Data Management System

The data recorded by the monitoring equipment will be aggregated monthly. The receipt of tipping fee, electricity sales and the invoices of electricity purchase and auxiliary fuel purchase will be preserved. The monitoring data will be aggregated monthly. The relevant department will aggregate the data periodically and report to the VCS manager. All data records will be kept for two years after the end of the crediting period.

7. Monitoring Report

The Monitoring Report is for the purpose of describing the implementation of the Monitoring Plan, presenting the monitoring results and data, calculating the actual emission reductions

and summarizing the Monitoring Plan during the past year. The annual monitoring report will be submitted by the VCS manager, and the contents will include, but are not limited to, the following:

- Calibration report of the monitoring equipment (including relevant laws and regulations).
- Maintenance and overhaul report of the monitoring equipment.
- Summary report of the testing methods of monitoring data and the monitoring results.
- Process and results of the emission reduction calculation.
- Summary report of the annual implementation of monitoring plan.
- Other information related to the monitoring plan.

The VVB will annually verify the emission reductions of the project. The project participants will offer all the information as required for verification, including monitoring data, monitoring report and other information.

8. Training program

The Project Entity will entrust professional engineers and experts to train all the relative staff before operation of Proposed Project. The training will contain VCS knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations etc.