



QINGDAO XIAOJIANXI PHASE II MSW LANDFILL SITE LFG RECOVERY TO POWER PROJECT



Project title	Qingdao Xiaojianxi Phase II MSW landfill site LFG recovery to power project
Project ID	2353
Monitoring period	01-April-2023 to 31-December-2023
Original date of issue	19-April-2024
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Version	03
VCS Standard Version	4.7
Prepared by	Qingdao Baichang Environmental Technology Co., Ltd.

CONTENTS

1.1	Summary Description of the Implementation Status of the Project	4
1.2	Audit History	4
1.3	Sectoral Scope and Project Type	5
1.4	Project Proponent	5
1.5	Other Entities Involved in the Project	5
1.6	Project Start Date	6
1.7	Project Crediting Period	6
1.8	Project Location	6
1.9	Title and Reference of Methodology	7
1.10	Double Counting and Participation under Other GHG Programs	7
1.11	Double Claiming, Other Forms of Credit, and Scope 3 Emissions	8
1.12	Sustainable Development Contributions	10
1.13	Commercially Sensitive Information	12
2.1	Stakeholder Engagement and Consultation	12
2.2	Risks to Stakeholders and the Environment	21
2.3	Respect for Human Rights and Equity	25
2.4	Ecosystem Health	28
3.1	Implementation Status of the Project Activity	30
3.2	Deviations	32
3.3	Grouped Projects	32
3.4	Baseline Reassessment	32
4.1	Data and Parameters Available at Validation	32
4.2	Data and Parameters Monitored	35
4.3	Monitoring Plan	44
5.1	Baseline Emissions	47
5.2	Project Emissions	51
5.3	Leakage Emissions	52
5.4	GHG Emission Reductions and Carbon Dioxide Removals	52

<u>APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION</u>	56
<u>APPENDIX 2: <SUPPORTING EVIDENCE></u>	57

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Qingdao Xiaojianxi Phase II MSW landfill site LFG recovery to power project (hereafter referred to as the project) is located in Hongdao Economic zone, Qingdao City, Shandong Province, P.R. China. The project is invested, constructed and operated by Qingdao Baichang Environmental Technology Co. Ltd.

The project captures the landfill gas that would have been released to the atmosphere in the absence of the project and generates electricity with the landfill gas. The electricity is supplied to the North China Power Grid (NCPG) to replace the electricity generated from coal-fired power plants of NCPG.

The purpose of the project is to utilize landfill gas (LFG) from the Qingdao Xiaojianxi MSW landfill site, which consists mainly of methane, for electricity generation. The landfill handles an average of 3,500 tonnes MSW per day which is mainly from Qingdao City. The project activity consists in LFG collection, transmission and treatment system, with subsequent electricity generation and grid connection system. VERs are claimed from the methane destroyed by power generation system and the power displacement. The feed-in electricity is estimated to be 145,625MWh during the fixed 10 years crediting period. The expected average annual emission reductions are 73,156 tCO_{2e}.

The project started construction on 08-January-2019 and commissioned on 13-April-2019. This monitoring period is from 01-April-2023 to 31-December-2023. The total installed capacity is 5.95MW, including 7 sets with each capacity of 0.85MW. For this monitoring period, the net electricity delivered to NCPG was 16,228.629MWh. The total GHG emission reduction was 95,812 tCO_{2e}

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/verification	06-April-2021	VCS	LGAI Technological Center, S.A. (Applus+ Certification)	/
Validation/verification	(13-April-2019—30-June-2021)	VCS	LGAI Technological Center, S.A. (Applus+ Certification)	2 years and 78 days
Validation/verification	(01-July-2021—31-March-2023)	VCS	CTI Certification	1 years and 274 days
Validation/	(01-April-2023—	VCS	CTI Certification	275 days

verification	31-December-2023)			
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1.3 Sectoral Scope and Project Type

The project is a non-AFOLU project.

Sectoral scope ¹	1.Energy (renewable-/non-renewable) 13.Waste handling and disposal
Project activity type	Non-AFOLU project; not a grouped project

1.4 Project Proponent

Organization name	Henan BCCY Environmental Energy Co., Ltd.
Contact person	Jinzhu Peng
Title	Minister of carbon emission department
Address	8th Floor, Hengmei Business Building, Dongfeng Str.22, Zhengzhou, China
Telephone	+86 371 56737901
Email	pengjinzhu@bccynewpower.com

1.5 Other Entities Involved in the Project

Organization name	Qingdao Baichang Environmental Technology Co., Ltd.
Role in the project	Project Operation Entity
Contact person	Lei Wang
Title	Minister of carbon emission department
Address	8th Floor, Hengmei Business Building. Dongfeng Str.22, Zhengzhou, China
Telephone	+86 371 56737901
Email	lwang@bccynewpower.com

¹ 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>

1.6 Project Start Date

Project start date	13-April-2019
Justification	According to VCS standard, the project start date of a non-AFOLU project is the date on emission reductions or carbon dioxide removals. The commissioning start date is 13-April-2019. Thus, this date is the start date of the project.

1.7 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 or fixed crediting period	13-April-2019 to 12-April-2029

1.8 Project Location

The Project is located in Xiaojianxi MSW landfill site, Hongdao Economic Zone, Qingdao City, Shandong Province, P.R. China. The geographical coordinates of the project site are longitude 120 °09 '26.06 "E and latitude 36 °16 '53.04 "N. Figure 1.1 shows the location of the Project.





Figure 1. 1 Location of the Project

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0001	Flaring or use of landfill gas	19.0
Tool	02	Combined tool to identify the baseline scenario and demonstrate additionality	07.0
Tool	05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0
Tool	04	Emissions from solid waste disposal sites	08.0
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	32	Positive lists of technologies	04.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

The project is not registered or 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.

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

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.

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

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

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

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 tCO₂e 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 sector nor the annual GHG emissions of the project proponent surpass 26,000 tCO₂e, 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.

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

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.

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

The goal of the project is to recover landfill gas for power generation only, generating electricity that is directly connected to the North China power grid. The project is vcs development only and no other assets with environmental benefits such as green certificates have been developed. Also no carbon emissions from any goods or services are involved in the course of the project activities, so there is no impact on emissions from goods and services in the supply chain.

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☐ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, “Carbon credits may be issued through the Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project

proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities].”

☐ Yes

☐ No

1.12 Sustainable Development Contributions

The Project contributes to sustainable development in the following ways:

. SDG 13 Climate Action

The project reduces greenhouse gas emissions, which contributes to the China's commitment to peak carbon dioxide emissions before 2030. Total GHG emission reductions and removals of 731,560tCO₂e will be achieved during the fixed 10 years crediting period.

. SDG 8 Decent works and Economic Growth

The project can provide permanent and full-time job opportunities over the project lifetime.

. SDG 7 Renewable energy generated

Total electricity generation supplied by the project to the grid is estimated to be 145,625MWh, which could replace the equivalent electricity from fossil.

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The project avoided anthropogenic emissions of greenhouse gases (GHG) of 95,812tCO ₂ e during the 3 rd monitoring period (01-April-2023 to 31-December-2023)	Prevented the release of 620,109tonnes of CO ₂ into the atmosphere during the monitoring period (13-April-2019 to 31- December -2023)
2)	8.5	Total number of job opportunities	Implemented activities to increase	The project activity employs 15 permanent and full-time employees through its operational company Qingdao Baichang Environmental Technology Co. Ltd. during the 3 rd monitoring period (01-April-2023 to 31-December-2023)	During the monitoring period (13-April-2019 to 31-December-2023), 15 permanent and full-time jobs were offered.
3)	7.2	MWh of renewable energy generated	Implemented activities to increase	Total 16,230.459 MWh of renewable energy generated during the 3 rd monitoring period (01-April-2023 to 31-December-2023)	During the monitoring period (13-April-2019 to 31-December-2023), 113,947.959 MWh of renewable energy was generated.

1.13 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

This stakeholder's identification starts by listing all the people or groups who might have an influence over or be impacted by the project. The local government, village committees, the employees of landfill site , landfill personnel, project company personnel and local residents were considered to be the key informants who know about the project, therefore, they are considered as project stakeholders.

Stakeholder Analysis:

Stakeholder Category	Direct/Indirect Affected	Relevance to the Project Activity
The local government	Direct affected	These governmental bodies are directly involved in regulating and overseeing various aspects of the project, including environmental regulations, and industrial development permits and licenses, and enforce compliance with relevant laws and regulations.
Village	Direct affected	As they live in close proximity to the landfill,

	committees		they are directly impacted by its operations, including factors such as noise, smoke, and potential environmental concerns.
	The employees of landfill site , landfill personnel and local residents	Direct affected	As they live in close proximity to the landfill, they are directly impacted by its operations, including factors such as noise, smoke, and potential environmental concerns. And they may be offered jobs.
	Project company personnel	Direct affected	Project company personnel are involved in the development of abatement projects, and the salary package is directly related to the operation of the project.
Legal or customary tenure/access rights	The project is located at Xiaojianxi Phase II MSW landfill site of Hongdao Economic zone, Qingdao City. On 4-April-2018, a lease agreement was signed with Qingdao Solid Waste Disposal Company Limited, Valid until 2-October-2029, According to the property right certificate provided, the land is solely owned by Qingdao Solid Waste Disposal Limited Liability Company, which does not involve the occupation of farmland, relocation compensation and other issues. Thus, there is no land issue involved in this project. According to the cooperation agreement signed between the project owner and Qingdao Solid Waste Disposal		

	Company Limited (4-April-2018 to 2-October-2029) the project owner has the right to use their LFG for power generation.
Stakeholder diversity and changes over time	Stakeholder diversity: The local government, village committees, local residents and employees of Xiaojianxi Phase II MSW landfill site are affected by the project activity directly. The employees of Xiaojianxi Phase II MSW landfill site: The employees of Xiaojianxi Phase II MSW landfill site primarily local residents seeking employment opportunities in xiaojianxi. While they may share similarities in backgrounds, there might still be diversity within this group in terms of age, education level, previous work experience and income level. Over time, the makeup of this workforce may evolve as the project progresses, potentially influenced by factors such as workforce turnover, training opportunities, and changes in project requirements. Interactions among project workers could involve collaboration on tasks, skill-sharing, and fostering a supportive work environment. The local residents near Xiaojianxi Phase II MSW landfill site: Residents living near Xiaojianxi Phase II MSW landfill site are of all ages and have different levels of education. Because of their different jobs, they have different incomes. Besides, they have different social networks and ways of interacting with each other. Population survey data for Licang District, Qingdao is as follows²: Confirmation of local population distribution in LPC. The resident population of the district is 737,281. Of these, 49.43 per cent are male and 50.57 per cent are female. Of the total population of the district, 16.72 per cent are aged 0-14, 66.30 per cent are aged 15-59, and 16.98 per cent are aged 60 and above, of which 11.06 per cent are aged 65 and above. Of the total population of the region, 36,356 were educated at the university level (college and above), 17,580 at the high school level (including junior college), 23,237 at the junior high school level, and 13,271 at the primary school's level. Of the city's population, 7,688,474, (76.34%) live in towns, while 2,383,248(23.66%) live in villages. The local government: These stakeholders focus on regulatory compliance, environmental protection, and economic development related to the project. Interactions among government

² http://qdsq.qingdao.gov.cn/szfz_86/qdnj_86/2021b/tjzl1/202209/t20220921_6397495.shtml

	officials could involve policy discussions, regulatory enforcement, and coordination efforts to address environmental and economic concerns associated with the project. Collaboration between government agencies and other stakeholders may be crucial for achieving project objectives while ensuring compliance with regulations and fostering sustainable development. But different government authorities may have different policies and regulations. The village committees: The main work of the Village Committee is to resolve visits and enquiries from villagers. Assisting in processing documents and information of the village committee and informing and organizing participation of villagers in stakeholder meeting, taking minutes of relevant meetings. This group usually has a high level of education and awareness. Over time, co-operation with the village committee will play an important role in the smooth running of this project.
Expected changes in well-being	Relative to the baseline scenario, the project will bring about the following changes: 1. Economic well-being – the project activity is likely to provide employments to the locality thus economic well beings are expected; 2. Environmental well-being – (1) as this project activity reduces the methane emissions in atmosphere by recovering and utilizing LFG to generate electricity, it will bring environmental well-being in the locality. (2) Total electricity generation supplied by the project to the grid is estimated to be 16,230.495MWh, which could replace the equivalent electricity from fossil fuel-based grid.
Location of stakeholders	The location of stakeholders is Hongdao Economic zone, Qingdao City, Shandong Province, P.R. China.
Location of resources	Employees of the Xiaojianxi Phase II MSW Landfill are clothed, fed, housed, and transported using resources in the vicinity of the landfill. Clothing, food, and shelter for residents and Village Council personnel in the vicinity of the landfill are located at Qingdao Little Sword Creek. The resources used by local government personnel are located in Qingdao. The resources used by the Project are landfill waste, and the resources used by these stakeholders do

	not conflict with the Project. PP has the ownership of LFG for recovering and treatment by contracting Qingdao Solid Waste Disposal Company Limited from 4-April-2018 to 2-October-2029. According to the property right certificate provided, the land is solely owned by Qingdao Solid Waste Disposal Limited Liability Company, which does not involve the occupation of farmland, relocation compensation and other issues. Thus, there is no land issue involved in this project.
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2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	During the project monitoring period (01-April-2023–31-December-2023), a stakeholder meeting was conducted on 25-July-2023 in the conference room of Qingdao Baichang Environmental Technology Co., Ltd. The participants were mainly landfill staff, the local government and invited local residents. The content of the meeting is as follows:1. Yao Hongliang, Plant Director of Qingdao Baichang, introduced the basic information of Qingdao Xiaojianxi Phase II MSW Landfill LFG Recycling and Power Generation Project and the operation of the project during the 3rd monitoring period, and collected villagers' concerns about environmental pollution, noise and other issues. The project did not experience any emergencies, methane leaks, or exhaust pollution during the monitoring period. Specifically, it is possible to query cycle reports within the operating log. 2. Qingdao Xiaojianxi II Sanitary Domestic Waste Landfill Director commented on Qingdao Xiaojianxi II Domestic Waste Biogas Power Generation Project, he thinks that the construction of this project not only collects gas, purifying and treating the gas to generate electricity and connect to the grid, but also harmless treatment of rubbish. At the same time, it can also increase employment, contribute to local economic development, and thus promote economic and natural. He fully supports the project. 3. Villagers attending the meeting were invited to ask questions and comment on environmental and noise. The
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	plant manager gave the following reply to the above question: (1) The vibration and noise reduction devices of the generator room in the power plant, as well as the green isolation zone around the plant, have weakened the noise to a certain extent; the relevant measures can be further strengthened in the future to optimize the reduction of noise. (2) Activities such as waste recycling in power plants not only reduce waste emissions, but also provide flexibility in recycling and giving new life to old items. The activities were well received by the villagers in attendance. All the people in this meeting expressed great satisfaction and had no other comments.
Date(s) of stakeholder consultation	During this monitoring period, we held a stakeholder meeting on 25-July-2023 , to collect comments from all stakeholders, such as representatives of local residents, Xiaojianxi MSW landfill site, the project owner and Village committees. The project owner appointed one person to make a meeting minute.
Communication of monitored results	During this monitoring period, one stakeholder consultation meeting was held. At the meeting, the plant manager informed the stakeholders about the recent operation of the project. At meeting, the project owner informed stakeholders to install sound insulation and plating of green isolation belts on site to reduce noise; The project area does not occupy the farms of local residents; At the project site, waste recycling was carried out to reduce waste emissions, and the project site is far away from residential areas. The effect of the noise from the plant is little to local residents. One set of landfill gas generator set tail gas reprocessing SCR system is set at the end of each generator set, and the treated exhaust gas meets the “Comprehensive Emission Standards for Regional Air Pollutants in Shandong Province” (DB37/2376-2013), and will not pollute the atmosphere. Questions raised by stakeholders were answered on site.
Consultation records	When a stakeholder consultation meeting is held, one

	person is designated to record the meeting. The questions and suggestions raised by stakeholders at the meeting were recorded. A grievance expression book was put in the office of the project, which is used to collect stakeholders' views about the project. Project Participant checked the comments in the book on a regular basis, and record responses. The project information with contact information was also posted on the bulletins at and nearby the project site. Every stakeholder can make comments by grievance expression book or contact information. No relevant complaints and recommendations were received during the project monitoring period.
Stakeholder input	During the consultation, all stakeholders were supportive of the project, there were no negative comments received for the project. There are no updates to the project design.

2.1.3 Free, Prior, and Informed Consent

Consent	Based on the principle of friendly consultation and on the basis of truly and fully expressing their respective wishes, the project owner and Qingdao Solid Waste Disposal Company Limited signed a cooperation agreement on 4-April-2018, until 2-October-2029 The project owner distributed questionnaires to local residents who may be impacted by the project in order to collect advice for the project. The aim of these questionnaires was to collect opinions concerning the influence the project would have on the local society, environment, economy, daily life etc. The stakeholders were informed about the stakeholder meeting through posters on 01/12/2018. In the bulletin, the company invited the potential stakeholders to get to know their opinions and/or suggestions about the implementation of the project and VCS application of the project. The stakeholder consultancy meeting for the parties interested in the project was organized at Xiaojianxi Landfill site on 15/12/2018 to collect opinions from all stakeholders, such as representatives of local residents, Xiaojianxi solid
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	waste management station, and the project owner and so on. There are 15 stakeholders attended the stakeholder consultation meeting and the project owner had taken meeting minute. During the stakeholder consultancy meeting, some stakeholders worried that the project will bring noise, land occupying and pollution on employees and local residents' living. For these issues, the project owner will offer some measures: i.e. installation of sound proof devices and plating of green isolation belts are used for mitigating noise; the area the project built on only will not occupy farms of local residents; at the project site, waste recycling will be carried out reduce emit of waste, and the project site meanwhile will be far from the residential area, so the effect of the noise from the plant is little to local residents. All attendances to the meeting were satisfied to the measures. As a whole, the impacts of construction of the project are basically positive. All stakeholders were pleased with the development of the project. The VCS project would actually facilitate the development of the local economy and increase the income of local residents. No changes during the monitoring period; changes will be communicated. If there are changes in the project design, any events that occur during the operation of the project, or emergencies that involve stakeholder interests, or any related mitigation measures, the project owner will notify the stakeholders in advance by means of email posters, etc. in advance. There are not ongoing or unresolved conflicts.
Outcome of FPIC	The Project is located in Xiaojianxi MSW landfill site, Hongdao Economic Zone, Qingdao City, Shandong Province, P.R. China. The nature of the land of Qingdao Xiaojianxi Landfill is state-owned construction land allocation, and the right of use is solely owned by Qingdao Solid Waste Disposal Co., Ltd, According to the cooperation agreement and land lease agreement signed between the project owner and Qingdao Solid Waste Disposal Co., Ltd., the project holder owns the right to use the land, and there is no infringement of the rights of other third parties.

	Based on questionnaire surveys and stakeholder consultation meetings, local residents have expressed support for the project. The impacts of construction of the project are basically positive. All stakeholders were pleased with the development of the project. The VCS project would actually facilitate the development of the local economy and increase the income of local residents. According to the project cooperation agreement and the land lease contract, the project has not encroached on land, relocated without consent, forcibly evicted or economically evicted.
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2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
No grievance was received during the monitoring period.	Not applicable

During the stakeholder meeting, we have told the stakeholders about the grievance procedure of the project. They all agreed with the grievance procedure and felt the procedure was easily accessible to them for ongoing consultation.

During the monitoring period, the project information and the continuous grievance mechanism have been introduced to the local stakeholders. The project information with contact information has also been posted on the bulletins at the project site and nearby, which states that there is grievance book at the project site, and everyone is welcome to give comments.

When a person raises grievance, The recipient acknowledges receipt of the grievance normally and send a written statement to the manager of PP within 5 working days. The recipient explains the grievance procedures to the person and refers the case to the appropriate person (the case handler). The case handler takes actions and prepares a report within 10 working days. The report will be made available to the person who raises the grievance. The person concerned will be informed in writing of the decision with a copy to the manager of PP.

The continuous input/grievance mechanism is as below :

Method Chosen (include all known details e.g. location of book, phone number)		Justification
Continuous	A grievance book is put at the project site.	The grievance book is kept at the project owner office. Everyone can go

Input/Grievance Expression Process Book		there to record their grievance or comment in the book. The project owner personnel will review and respond to the comments and record the response in the book as well.
Telephone access	+86 18737823320	Ms. Lei Wang, Qingdao Baichang Environmental Technology Co. Ltd.
Phone number of the village committee	(0532)7825855	Any grievance not resolved through amicable negotiations shall be referred to the Village Board for mediation
Qingdao Laoshan District People's Court Phone	0532-88895802	If the village committee cannot mediate the conflict, you can file a lawsuit in the People's Court of Laoshan District, Qingdao.

The project has not received any information during the monitoring period.

2.1.5 Public Comments

There are no updates to the project design.

Summary of comments received	Actions taken
No negative comments were received during the stakeholder consultation or outside of the public comment period.	Not applicable

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	Based on the stakeholder meeting, the stakeholders involved in the project are very supportive of the project. The investment, construction and operation of the project are in compliance with the relevant laws and regulations of the People's Republic of China. Therefore, the project has no risks on stakeholder participation.

Working conditions	No risk identified	The investment, construction and operation of the project are in compliance with the relevant laws and regulations of the People's Republic of China. The Project's purpose is to supply electricity from the methane recovery of biogas to replace fossil fuel power. It is beneficial to local people. The Project has DCS system. Therefore, most of the employees work in indoor environment (at the office), instead of having to stand outside. In case of on-site monitoring and device maintenance, the project owner provides safety protection equipment. A small amount of waste gas, wastewater, noise and solid waste may be generated during the operation of the project, but after the treatment by environmental protection facilities, it will not have any impact on human body. For example, the PP installed fire extinguishing exhaust silencers on generators to avoid noise. 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 undertaken as per the approved EIA and carry out regular occupational health and safety testing every year to ensure the safety and healthy working environment, such as established "ISO45001 Occupational Safety Management System Certification", organized regular Employee Physical Examination, invited third part to monitor the environment influence.
Safety of women and girls	No risk identified	China has published "Women's Rights Protection Law"³ to provide support and protection to women and girls. The project owner has strictly complied with these laws and regulations. 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 the project. During the implementation of the project, all personnel involved in the project are trained in gender sensitivity on 25-june-2023, 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

³ https://www.gov.cn/guoqing/2021-10/29/content_5647634.htm

		reporting mechanisms so that women can report any safety issues or acts of gender discrimination, ensuring that their voices are adequately addressed and protected. During the current monitoring period, no conflicts or contradictions have been detected in relation to it.
Safety of minority and marginalized groups, including children	No risk identified	China has published protection laws on the minors⁴. Employment regulations are described in this Law. The Project requires skilled employees to operate, maintain, and manage the power plant. Therefore, the project does not employ and is not complicit in any form of child labour. According to the Employee list, it could be confirmed that the Project does not employ any child labour. Project activities provide equal job opportunities, do not discriminate against marginalized groups. The company has regular staff training on non-discrimination against marginalized groups. There is also an in-house employee handbook, and a WeChat microblogging program feedback mechanism to protect employee safety and other issues. 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)	No risk identified	On 29/11/2018, an environmental impact assessment (EIA) was completed in accordance with Chinese regulation as part of the feasibility study for the Project and was approved by the Environmental Protection Bureau of High-tech District, Qingdao city on 12/12/2018. The objective of this EIA was to identify the effects of the project on both the biophysical components of the environment and socio-economical aspects of local community and to provide measures and procedures to mitigate the possible effects. The outcome of the EIA was favorable and the project was found to have no significant environmental impacts. The project not only reduces the danger caused by uncontrolled release of LFG, but also reduces the pollution caused by the landfill to the air, soil and water quality in the local area. From environmental protection perspectives, the project is in compliance with national industry policy, promoting sustainable development and utilization of waste. During the crediting period, the mitigation measures were implemented and the following key aspects were addressed:

⁴ http://www.gov.cn/xinwen/2020-10/18/content_5552113.htm

Wastewater

The main sources of wastewater pollution in the project are softening wastewater and employees' living wastewater. The softening wastewater generated by the project is relatively small, and together with the domestic sewage, it is first treated by septic tank and then discharged into the sanitary landfill regulating tank of Xiaojianxi domestic waste. The main pollutants in domestic sewage after septic tank treatment are: COD $\leq$ 450mg/L, BOD₅ $\leq$ 250mg/L, SS $\leq$ 200mg/L, ammonia nitrogen $\leq$ 30mg/L, and its water quality meets the B-level standard of "Sewage discharged into urban sewerage water quality standards (GB/T31962-2015). Therefore, it will not cause harm to the water environment.

Waste Gas

LFG is pretreated by iron oxide for H₂S removal, filtration, dust removal and dehydration. The exhaust gas produced by combustion is disposed by seven SCR systems, and finally discharged through seven exhaust cylinders(15m-high). Concentrations and emission rates of the pollutants (mainly SO₂, NO_x and smoke) of residual gas after utilization of LFG meet the requirement of "Integrated emission standard of air pollutants" (GB16297-1997).

Noise pollution

The project adopts the following measures to make the noise meet the category II of "Displacement noise standard for industrial enterprise" (GB12348-2008):

The vibration reduction device installed on the base of the project generator set;

The internal combustion generator set is arranged in the power plant;

Install fire-fighting exhaust silencer;

Production workshop set up sound insulation;

The outdoor fan adopts the foundation shock absorber and the muffler is installed.

Solid waste

Household waste is collected and sent to Xiaojianxi MSW landfill site for treatment. Hazardous waste is recycled by the manufacturer. Waste oil shall be set up a hazardous waste temporary storage room and entrusted with hazardous waste disposal qualified units for disposal.

According to the project annual environmental monitoring reports issued by a third party with professional qualifications, the project has adopted various effective measures to control environmental impacts, and the monitoring data is in line with environmental protection requirements.

Therefore, the project will have no negative impact on the

environment.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment

No discrimination or sexual harassment was occurred. China has published “Labor Law”⁵ and “Women’s Rights Protection Law”, and the project has strictly complied with the relevant laws and regulations. The project proponent respect human rights in accordance with the International Bill of Human Rights and universal instruments relating to human rights in project design and implementation. Signing and the project company drew up a staff handbook and signed legally binding labour contracts with all staff. As can be seen from the project's staff roster, there are three female incumbents, indicating that there is no gender discrimination.

On the Credit China website⁶, can check the criminal records of all Chinese enterprises, and Qingdao Baichang Environmental Technology Co., Ltd. does not have any relevant records, indicating that there is no sexual harassment in the project.

Management experience

Local governments such as Bureau of Qingdao Hi-Tech Zone Administrative Committee, Ecology and Environment Bureau of Qingdao City are the supervision organization which is in charge of guiding and coordinating the project's implementation. Local governments is in rich experience in ecological environment and local community management during project implementation.

The project proponent has several LFG projects and therefore has extensive development and management experience. It is available on the company's official website⁷.

Before the construction of the project, the project owner signed a contract with a professionally qualified construction unit. Therefore, the management team is experienced and very

⁵ https://www.gov.cn/banshi/2005-05/25/content_905.htm

⁶ <https://www.creditchina.gov.cn/xycn/?navPage=7>

⁷ <https://www.bccynewpower.com/q>

	professional in terms of their professional competence and experience in implementing such projects and participating in the community. At the same time the project has developed a recruitment strategy to fill gaps in skills and experience.
Gender equity in labor and work	Project participants receive equal pay for equal work during project design and implementation. Project participants strictly abide by labour laws and sign labour contracts with their employees. The same salary standards are set for the same positions. The legitimate rights and interests of employees are protected by Chinese laws. The project proponent employs women during the construction and operation period. The project has male and female employees of different genders, 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	The project will not use victims of human trafficking, forced labor, and child labour. Human trafficking is a serious crime that is strictly regulated and combated in the Chinese legal system. The project proponent strictly abides the labour law, and will verify the identity of the employees, and if unidentified workers are found, the project proponent will report to the local police. The relevant laws and regulations mainly include the “CriminalLaw”⁸and the “Criminal Procedure Law”⁹. China has promulgated the “Labor Law” to protect the legitimate rights and interests of workers and prohibit forced labour. China has published protection laws on the minors. Employment regulations are described in this Law. The Project requires skilled employees to operate, maintain, and manage the power plant. Therefore, the project does not employ and is not complicit in any form of child labour. According to the Employee list, it could be confirmed that the Project does not employ any child labour.

⁸ <https://flk.npc.gov.cn/detail2.html?ZmY4MDgxODE3OTZhNjM2YTAxNzk4MjJhMTk2NDBjOTI>

⁹ <https://flk.npc.gov.cn/detail2.html?ZmY4MDgwODE2ZjEzNWY0NjAxNmYxZDFiODFiMDEzNTE%3D>

2.3.2 Human Rights

Human rights protection is formally embodied in the regulations in China. China fully recognizes international human rights law. China has its own legislation in place prohibiting the violation of human rights principle and it actively enforces the compliance of such principle. China has ratified two UN human rights treaties—the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social, and Cultural Rights. China has published relevant regulations and practice into line with the treaties, such as Labor Law.

This project does not discriminate with regards to participation and inclusion. The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination. Specific to gender equality, detailed enforcement rules are regulated in “Women’s Rights Protection Law” to provide support and benefits to women. The project owner has signed an employment contract with each employee and developed an employee handbook.

The project proponent and its activities are strictly regulated by local and national regulations, which obligate the project activities to in line with the international human right law and conventions. The legal approval by authorities demonstrate that the project does not and will not violate the regulations. According to the relevant provisions of the Labor Law and Women’s Rights Protection Law of China, the project continues to recognize, respect, and promote the protection of the rights of IPs, LCs, and customary rights holders.

The project owner strictly complies with the above laws and regulations. PP has made positive efforts in respecting and protecting human rights: PP actively work with local communities to provide equal employment opportunities between men and women, and no child labor, no forced labor. PP provide training and employment opportunities for local communities to upgrade their skills and participate in project implementation. PP prioritize working with local communities to ensure they can directly benefit from the project and participate in the decision-making process. PP respect the right of local communities about FPIC (Free, prior, and informed consent). And a on-going communication mechanism was established during the project monitoring period, allowing stakeholders to voice their complaints and suggestions at any time. PP listen to their views and aspirations. PP respect their traditional knowledge, culture and customs and fully consider their views and interests in the planning and implementation of projects. PP respect the rights of 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.

2.3.3 Indigenous Peoples and Cultural Heritage

According to the EIA report, no indigenous peoples present in or within the area of influence of the Project.

According to the EIA report, the Project area does not include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture.

2.3.4 Property Rights

Disputes over rights to territories and resources	The project was constructed at Xiaojianxi MSW landfill site, The project owner has entered into a land lease agreement with the holder of the land use right (Qingdao Solid Waste Disposal Co., Ltd.) According to the terms of the agreement, the project owner is leasing 5-8 acres of land, and the lease is valid for the period from 4 April 2018 to 2 October 2029. The project owner will pay for the land lease at a negotiated compensation price. Thus, the project do not involve land occupation or requisition, do not involve occupation or requisition of property rights, do not involve encroach on private, stakeholder, or government property or relocate people off their lands, and forced physical or economic displacement.
Respect for property rights	PP respect the rights of local communities to land, natural resources and other property, ensure that projects do not infringe on their land tenure, resource access and traditional ways of livelihood. At the same time the project will not result in forced physical or economic displacement.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	N/A.
Benefit sharing during the monitoring period	N/A.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	According to the EIA report of the project, it can be concluded that the project exhaust gas is mainly the combustion exhaust gas of the landfill gas of the generator set, and the main pollutants are soot, NO _x and SO ₂ . 7 sets of generator sets of the project run in the medium term with all the

		units open, and the exhaust gas generated by combustion is discharged by 7 sets of SCR system denigration treatment and then discharged through 7 15m-high exhaust tubes. The project's generator sets are internal combustion units, and when the units are running, the emission concentrations of soot, SO₂ and NO_x generated by landfill gas combustion meet the requirements of the standard limits for key control areas in Table 2 of the "Comprehensive Emission Standards for Regional Air Pollutants in Shandong Province" (DB37/2376-2013) (SO₂50mg/m³, NO_x100mg/m³, soot10mg/m³), and have a relatively small impact on the surrounding. The impact on the atmospheric environment is small. Therefore, the impact of the project on biodiversity and ecosystem is negligible.
Soil degradation and soil erosion	No risk identified	The project utilizes the LFG from Xiaojianxi MSW landfill site to generate electricity by gas engines. Therefore, there will be no impact on soil degradation and erosion.
Water consumption and stress	No risk identified	According to the EIA report, the domestic wastewater of the project is 85% of the water consumption, and the domestic wastewater discharge is 595.7m/a (1.63m/d). The main pollutants in domestic sewage after septic tank treatment can meet the Standard for the Quality of Sewage Discharged into Urban Sewerage (GB/T31962-2015) standard. The softening wastewater generated by the project is small, and domestic sewage (domestic sewage is first treated by septic tank) together with the xiaoJianxi sanitary landfill regulating pool of domestic waste, and into the rubbish leachate disposed of together. Therefore, the project will not cause pollution and pressure on the water environment.
Usage of fertilizers	No risk identified	The project is LFG recovery and utilization project. Therefore, the Project does not involve the application of fertilizers.

2.4.1 Rare, Threatened, and Endangered species

The project isn't located in, or adjacent to habitats for rare, threatened, or endangered species. Therefore, the following table isn't applicable.

Species or habitat	Not applicable
--------------------	----------------

2.4.2 Introduction of species

No planting or species introduction are in the project. This section is left as N/A.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A

According to EIA, no invasive species exist in the project area. Therefore, the following table isn't applicable.

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
N/A	N/A

2.4.3 Ecosystem conversion

Not applicable. The project isn't ARR, ALM, WRC or ACoGS project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity consists in LFG collection, transmission and treatment system, with subsequent electricity generation and grid connection system.

LFG collection system

LFG is extracted from MSW under negative pressure by blower pumps and moved through wells, then collected by gas collection stations and transferred by sub-pipes and a main pipe to LFG treatment equipment. Flow rate of the LFG is regulated at the collection points in order to always fit with the consumption capacity of the generation engines.

LFG treatment system

Prior to electricity generation, LFG is treated to remove impurities and moisture, to avoid corrosion in the engines. The treatment consists of filtration, de-moisturing, cooling and pressurization.

Electricity generation and grid connection system

7 gas engines of 850kW rated power each are fed with the LFG and generate electricity, which is then exported to the grid. The engine 1# 2# 3# 4# and 5# (745kW) were put into operation on 13-April-2019. The remain engine 6# and 7#(745kW) were put into operation on 01-July-2021.

Table 3 Equipment technical parameters

Main Equipment	Parameter	Value
Generator	Type	850GF-NK
	Manufacturer	CNPC Jichai Power Company Limited
	Rated Capacity	850 kW
	Rated rotation speed	1000 r/min
	Capacity factor	0.8 (lagging)

During the monitoring period from 01-April-2023 to 31-December-2023, the generation units have been working for about 42724 hours in total, the 1#, 2#, 3#, 4#, 5#, 6# and 7# gas engine have been operating for 6104, 6047, 6005, 6079, 6186, 6163 and 6140 hours, respectively. The important events during the operation of the project have been recorded in operation log. During this monitoring period, the project is in good operation. The project uses recovered landfill gas to generate electricity with a destruction efficiency of 100 per cent in the gas generator.

During operation, the LFG flow can be adjusted according to the demand of the project. Even if all the gas generators are shut down due to an emergency, the landfill will be able to contain the landfill gas. The solenoid valves on the inlet pipework at the front of each gas generator will also be activated automatically. The LFG will be temporarily stored in the landfill and pipework and is not likely to be vented to the atmosphere. During operation, the LFG flow rate can be adjusted according to the project's demand for LFG. During planned shutdowns, there is no collected and residual LFG in the overall project system. At the outset, the design takes into account the length and safety features of the pipeline, which has the capacity to store biogas. During the design and commissioning phases of the project, safety was considered and the design complied with the requirements. At same time, LFG is not being fed through the Roots Blower pumps, LFG is stored in the piping between the landfill and the pre-processing facility, and the landfill is equipped with gas wells that have the capacity to

store the LFG generated. When the facility is shut down in an emergency, the inlet pressure increases, the Roots blower pumps decrease in frequency, and less LFG is extracted from the landfill. This is an interlocking control that ensures that the pressure within the unit remains balanced and accommodates the very small amount of LFG stored in the pipework. So, the landfill gas does not enter the atmosphere, ensuring that all of the landfill gas collected is used to generate electricity and does not escape.

During this monitoring period, there were no simultaneous shutdowns of all units. The seven units would not be overhauled at the same time. Throughout the project, methane collection and use is unaffected by the maintenance of some units.

The project does not include any flare system.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation applied during this monitoring period.

3.2.2 Project Description Deviations

There is no project description deviation applied during this monitoring period.

3.3 Grouped Projects

The project is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

The parameter of methane generation from the landfill in the absence of the project ($BE_{CH_4, SWDS, y}$) is used for ex-ante estimation of relevant parameter $F_{CH_4, PJ, y}$. For $F_{CH_4, PJ, y}$, there is an expost determination method. Thus, in this monitoring period, $BE_{CH_4, SWDS, y}$ and the relevant basic parameters (ϕ_y , OX , F , DOC_f , MCF_f , K_j , $W_{j, x}$, DOC_j , f_y , η_{PJ}) for calculation of $BE_{CH_4, SWDS, y}$ are not included here.

Data / Parameter	$OX_{top, layer}$
Data unit	-
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Emission from the solid waste disposal sites (version 8.0)
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	GWP_{CH_4}
Data unit	tCO_2e/tCH_4
Description	Global warming potential of CH_4
Source of data	IPCC
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	IPCC Fifth Assessment Report (AR5)
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ρ_{CH_4}
Data unit	t/m^3
Description	Density of methane gas at Normal Conditions
Source of data	-

Value applied	0.0007168 (Normal conditions: 0°C and 101.325kPa)
Justification of choice of data or description of measurement methods and procedures applied	At standard temperature and pressure (0 degree Celsius and 1,013 bar) the density of methane is 0.0007168 tCH ₄ /m ³ CH ₄
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid, OM, y}
Data unit	tCO ₂ /MWh
Description	Operation margin emission factor of NCPG
Source of data	2017 Bulletin on the Baseline Emission Factors of the China Grids
Value applied	0.9680
Justification of choice of data or description of measurement methods and procedures applied	The value is published by Ministry of Ecology and Environment of the People's Republic of China, based on China Electric Yearbook (2014-2016), Electricity Industry Statistics (2013-2015), China Energy Statistic Yearbook (2014-2016) and IPCC data
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid, BM, y}
Data unit	tCO ₂ /MWh
Description	Build margin emission factor of NCPG
Source of data	2017 Bulletin on the Baseline Emission Factors of the China Grids
Value applied	0.4578
Justification of choice of data or description of measurement methods and procedures applied	The value is published by Ministry of Ecology and Environment of the People's Republic of China, based on China Electric Yearbook (2014-2016), Electricity Industry Statistics (2013-2015), China Energy Statistic Yearbook (2014-2016) and IPCC data.
Purpose of Data	Calculation of baseline emissions

Comments	-
Data / Parameter	TDL _{j, y} and TDL _{k, y}
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j, k in year y
Source of data	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)
Value applied	Use as default values of 20% for project consumption sources; Use as default values of 3% for baseline electricity consumption sources. i.e.: TDL _{j, y} =3%, TDL _{k, y} =20%
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of Baseline, project and/or leakage emissions from electricity consumption
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	Management of SWDS
Data unit	-
Description	Management of SWDS
Source of data	Original design of the landfill
Description of measurement methods and procedures to be applied	Project participants should refer to the original design of the landfill to ensure that any practice to increase methane generation have been occurring prior to the implementation of the project activity. Any change in the management of the SWDS after the implementation of the project activity should be justified by referring to technical or

	regulatory specifications.
Frequency of monitoring/recording	Annually
Value applied	Since the implementation of the project activity, no changes have taken place in the management of the landfill. By the end of the implementation of the project, the provisions on methane recovery and utilization have not changed in the current effective laws and standards in China, and it is a common phenomenon in China that methane is discharged into the atmosphere without utilization.
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$Op_{j, h}$
Data unit	-
Description	Operation of the equipment that consumes the LFG
Source of data	Project participants
Description of measurement methods and procedures to be applied	For each equipment unit j using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. Document and justify the location and minimum threshold in the PDD; (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnaces. This option is not applicable to brick kilns. $Op_{j,h}=0$ when: (a) One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are

	made at least every minute); (b) Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); (c) No products are generated in the hour h. Otherwise, $Op_{j,h}=1$
Frequency of monitoring/recording	Hourly
Value applied	In this monitoring period, the operation hours of each generator are as follows. 6,104 h (generator 1#) 6,047 h (generator 2#) 6,005 h (generator 3#) 6,079 h (generator 4#) 6,186 h (generator 5#) 6,163 h (generator 6#) 6,140 h (generator 7#)
Monitoring equipment	-XXX
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	The operation hours of the generator are timed by a built-in programme, which belongs to the control module of the generator set. and the probability of problems with this controller is very small so it does not require daily calibration and maintenance.

Data / Parameter	$F_{CH_4, BL, R, y}$
Data unit	tCH ₄ / yr
Description	Amount of methane in the LFG which is flared due to a requirement in year y
Source of data	Information of the host country's regulatory requirements relating to LFG, contractual requirements, or requirements to address safety and odour concerns.

Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	Total 856.09 tCH ₄ during this monitoring period.
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	Applicable to Case 2 of section 5.4.1.3 of ACM0001“Flaring or use of landfill gas” (version 19.0)

Data / Parameter	$\rho_{reg,y}$
Data unit	Dimensionless
Description	Fraction of LFG that is required to be flared due to a requirement in year y
Source of data	Information of the host country’s regulatory requirements relating to LFG, contractual requirements, or requirements to address safety and odour concerns.
Description of measurement methods and procedures to be applied	According to the methodology ACM0001(version 19.0), if the requirement does not specify any amount or percentage of LFG that should be destroyed, but requires the installation of a system to capture and flare of the LFG, then a typical destruction rate of 20 percent is assumed.
Frequency of monitoring/recording	Annually
Value applied	20%
Monitoring equipment	-
QA/QC procedures to be applied	-

Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	Applicable to Case 2 of section 5.4.1.3 of ACM0001“Flaring or use of landfill gas” (version 19.0)

Data / Parameter	EG _{PJ,y}													
Data unit	MWh													
Description	Amount of electricity generated using LFG by the project activity in year y													
Source of data	Electricity meter													
Description of measurement methods and procedures to be applied	Measured continuously by electricity meter installed at the project site. All data will be monitored and archived electronically. Electricity bills can be cross-checked.													
Frequency of monitoring/recording	Continuous measurement													
Value applied	16,230.459 MWh during this monitoring period													
	<table border="1"> <thead> <tr> <th>Date</th><th colspan="4">EG_{PJ,y} (MWh)</th></tr> </thead> <tbody> <tr> <td>01-April-2023---- 31-December-2023</td><td colspan="4">16,230.459</td></tr> </tbody> </table>				Date	EG _{PJ,y} (MWh)				01-April-2023---- 31-December-2023	16,230.459			
Date	EG _{PJ,y} (MWh)													
01-April-2023---- 31-December-2023	16,230.459													
Monitoring equipment	Electricity meter													
	<table border="1"> <thead> <tr> <th>Model</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr> </thead> <tbody> <tr> <td>DSZ331</td><td>110029364505</td><td>0.5S</td><td>24-March-2023</td><td>23-March-2024</td></tr> </tbody> </table>				Model	Serial number	Accuracy class	Date of calibration	Validity	DSZ331	110029364505	0.5S	24-March-2023	23-March-2024
Model	Serial number	Accuracy class	Date of calibration	Validity										
DSZ331	110029364505	0.5S	24-March-2023	23-March-2024										
QA/QC procedures to be applied	The calibration should be done once a year by a qualified third party.													
Purpose of data	Calculation of baseline emissions													
Calculation method	-													
Comments	-													

Data / Parameter	EG _{EC,y}														
Data unit	MWh														
Description	Amount of electricity consumed by the project activity in year y														
Source of data	Electricity meter														
Description of measurement methods and procedures to be applied	Measured continuously by electricity meter(bi-directional) installed at the project site. All data will be monitored and archived electronically. Double check by receipt of electricity sales.														
Frequency of monitoring/recording	Continuous measuremen														
Value applied	1.830 MWh during this monitoring period <table><tr><td>Date</td><td colspan="4">EG_{EC,y} (MWh)</td></tr><tr><td>01-April-2023--- 31-December-2023</td><td colspan="4">1.830</td></tr></table>					Date	EG _{EC,y} (MWh)				01-April-2023--- 31-December-2023	1.830			
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Model	Serial number	Accuracy class	Date of calibration	Validity											
DSZ331	110029364505	0.5S	24-March-2023	23-March-2024											
QA/QC procedures to be applied	The calibration should be done once a year by a qualified third party.														
Purpose of data	Calculation of baseline emissions														
Calculation method	-														
Comments	-														

Data / Parameter	$V_{t,db}$
Data unit	m ³ dry gas/h
Description	-
Source of data	Monitored by project participant
Description of measurement methods and procedures to be applied	Volume flow measurement always refers to the actual pressure and temperature.

Frequency of monitoring/recording	Measured continuously by a flow meter (average hourly value was used in the calculations of baseline emission reductions). Data to be aggregated monthly.				
Value applied	1,827.91 (total flow for this monitoring period at normal conditions) The detailed calculation process has been showed in V _{t,db} operating report.				
Monitoring equipment	Flow meter				
	Model	Serial number	Accuracy class	Date of calibration	Validity
	BF-3000-2400	E01325000003	1.5	19-March-2023	18-March-2024
QA/QC procedures to be applied	Flow meter was subject to a regular maintenance and testing regime to ensure accuracy				
Purpose of data	Calculation of baseline emissions				
Calculation method	-				
Comments	Flow meter F is employed to monitor the temperature of the gaseous stream at the flow measurement point. According to the landfill gas pre-treatment technology agreement description, the temperature of the gaseous stream is 10~45 °C during this monitoring period, which is less than 333.15 K(60°C). Thus the gaseous stream is dry for calculating flow measurement of LFG FCH_4,PJ,y on a dry basis(FCH_4,PJ,y is calculated as volumetric flow of the gaseous stream in time interval t on a dry basis multiplied by volumetric fraction of greenhouse gas i in a time interval t on dry basis)				

Data / Parameter	$V_{i, t,db}$
Data unit	M ³ gas i/m ³ dry gas
Description	Volumetric fraction of greenhouse gas I in a time interval tons dry basis
Source of data	Monitored by the project participant
Description of measurement methods and procedures to be applied	Continuous gas analyzer operating in operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure and temperature.
Frequency of monitoring/recording	Continuous if not specified in the underlying methodology
Value applied	49.5% (average value) The detailed calculation process has been showed in ER Calculation

	Spreadsheet.										
Monitoring equipment	Gas analyzer										
	<table><tr><td>Model</td><td>Serial number</td><td>Accuracy class</td><td>Date of calibration</td><td>Validity</td></tr><tr><td>GTR196</td><td>61584/45</td><td>2%</td><td>19-March-2023</td><td>18-March-2024</td></tr></table>	Model	Serial number	Accuracy class	Date of calibration	Validity	GTR196	61584/45	2%	19-March-2023	18-March-2024
	Model	Serial number	Accuracy class	Date of calibration	Validity						
GTR196	61584/45	2%	19-March-2023	18-March-2024							
QA/QC procedures to be applied	Gas analyzer was subject to a regular maintenance and testing regime to ensure accuracy										
Purpose of data	Calculation of baseline emissions										
Calculation method	-										
Comments	-Flow meter F is employed to monitor the temperature of the gaseous stream at the flow measurement point. According to the landfill gas pre-treatment technology agreement description, the temperature of the gaseous stream is 10~45 °C during this monitoring period, which is less than 333.15 K(60°C). Thus the gaseous stream is dry for calculating flow measurement of LFG FCH_4,PJ,y on a dry basis(FCH_4,PJ,y is calculated as volumetric flow of the gaseous stream in time interval t on a dry basis multiplied by volumetric fraction of greenhouse gas i in a time interval t on dry basis)										

Data / Parameter	CAPEX and OPEX
Data unit	CNY
Description	Total investment to implement the project and total cost to operate the project
Source of data	Engineering, procurement and construction contracts; and maintenance contracts
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	At the first issuance request after each phase of the project is fully implemented
Value applied	CAPEX: 33,139,282.33 CNY OPEX: 4,664,400.31 CNY
Monitoring equipment	-

QA/QC procedures to be applied	Audited by professional, independent financial auditors. The DOE should only verify that the data provided corresponds to the data from independent financial auditors.
Purpose of data	Identify the baseline scenario and demonstrate additionality
Calculation method	-
Comments	The information provided for CAPEX shall indicate the investment made: (i) in the collection and flaring system; (ii) in the power plant and connection to the grid (if applicable); and (iii) in the purchase of the new boiler or refurbishment of the existing one and in the steam/hot air pipeline if steam/hot air is exported out of the project boundary (if applicable). The information supplied for OPEX shall indicate the costs for: (i) staff and maintenance involved in the operation of the collection and flaring system; and (ii) staff and maintenance involved in the operation of the collection and power generation system. The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality.

Data / Parameter	Tariff of electricity exported
Data unit	CNY/kWh
Description	Tariff of the electricity exported
Source of data	On-grid tariff approval
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	At the first issuance request after each phase of the project is fully implemented
Value applied	0.594
Monitoring equipment	-
QA/QC procedures to be applied	Audited by professional, independent financial auditors. The DOE should only verify that the data provided corresponds to the data from independent financial auditors

Purpose of data	Identify the baseline scenario and demonstrate additionality
Calculation method	-
Comments	The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality

4.3 Monitoring Plan

1. The requirement of monitoring plan

The project participant monitors the emission reductions by methods, indicators, and frequency required by Monitoring Methodology ACM0001 (Version 19.0) to ensure project ERs are measurable and real. The monitoring methodology is based on direct measurement of the amount of landfill gas captured and destroyed by the project and electricity generating units.

2 . Responsibilities of operational and management structure

The project participant implements this monitoring plan. The plan could be revised according to suggestions from VVB and the practical circumstances, in order to keep it consistent, transparent and conservative during the monitoring process.

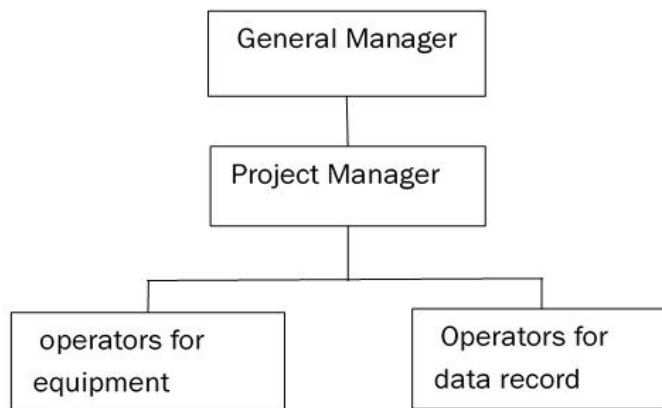


Figure 4.1 Operational and management structure

(1) Principal of the monitoring procedure

The general manager of the project is the leader of the monitoring tasks: he sets out the responsibility of everyone in the monitoring system, and establishes the related documents. The general manager ensures that staff in the monitoring system has the ability to deal with the assigned tasks.

(2) Executive person of the monitoring procedure

Project Manager: a Project Manager is appointed, specifically responsible for training, checking the daily operation, reporting forms and archiving emergency situation reports. The VCS Manager reports monthly to the General Manager (GM) about the project performance and monitored data. In the event that non-conformance in the performance to the mentioned procedures and/or functioning problems of the monitoring equipment is identified, the VCS manager informs the GM about the situation and work out relevant measures to be taken. The VCS manager also is responsible for aggregating the monitored data monthly and yearly, archiving and keeping data during the crediting period and two years after.

(3) Operators of the monitoring procedure

Operators take turns to work in the control center 24 hours a day. They are in charge of data supervision, filling operation report forms and, checking and inspecting the system. If necessary, they have the responsibility for executing the emergency plan and drafting emergency situation reports.

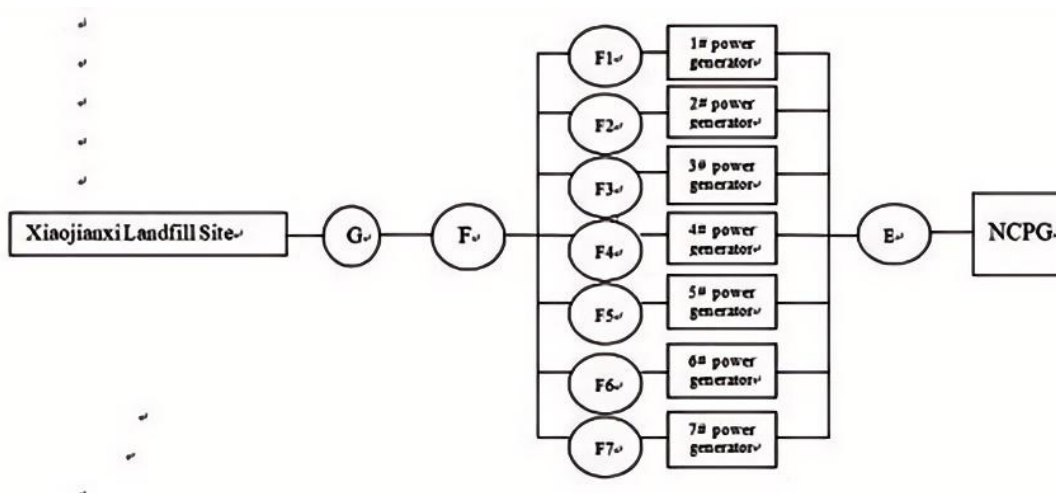


Figure 4.2 Monitoring system

Main parameters:

G	Gas analyzer to continuously measure methane fraction in LFG
F	Flow meter to continuously measure flow rate of total captured LFG, with automatic measure adjustment for temperature and pressure
E	Electricity meter (main meter, bi-directional) to continuously measure the electricity supplied to the NCPG and the electricity supplied by the grid

Net electricity exported to the grid:

Electricity meter E is the main meter for monitoring the net electricity supplied to and imported from the grid. Therefore, the net electricity supplied to the grid is calculated as: $EG_{OUT} - EG_{IN}$.

The meter E is installed at the project site and sends data to the DCS. The data was checked daily and totaled monthly. Electricity receipts and invoices was used as cross check during verification. E was calibrated by a qualified third party according to the industry standards and applicable regulations.

4.QA/QC

In order to ensure monitoring plan with high quality, QA/QC measures are carried out in monitoring data recording and checking, equipment calibrating and staff training.

Data recording: all data collected are recorded in electronic files which are regularly backed up. The data are checked by the specific staff every day and reported to General Manger by Project manager monthly. The data are archiving and keeping during the crediting period and two years after.

Equipment calibration and maintenance: Flow meters, gas analyzer, other critical project equipment's are subject to regular maintenance and testing according to technical specifications from the manufactures to ensure accuracy and good performance. The project manager is responsible for periodically sending the equipment to a professional third party for calibration.

If there is a problem with the project's monitoring equipment, the relevant data will be discarded during this period.

5. Emergency procedures

Once a meter in fault, it shall be immediately repaired or replaced with another calibrated meter by a professional engineer, and the LFG or electricity generated during the period of erroneous measurement and replacement of the fault meter shall not be accounted for conservative consideration.

Table4: Detailed calibration information

Name	Model	Serial number	Accuracy class	Date of calibration	Validity
Electricity meter E	DSZ331	110029364 505	0.5s	24-March-2023	23-March-2024
Flow meter F	BF-3000-2400	E01325000003	1.5	19-March-2023	18-March-2024

Gas analyzer G	GTR 196	61584/45	2%	19-March-2023	18-March-2024
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5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

$$BE_y = BE_{CH_4,y} + BE_{EC,y} \quad (1)$$

Parameter	Description	Unit	01/04/2023-31/12/2023
BE_y	Baseline emissions	tCO ₂ e	95,814
$BE_{CH_4,y}$	Baseline emissions of methane from the SWDS	tCO ₂ e	83,896.48
$BE_{EC,y}$	Baseline emissions associated with electricity generation	tCO ₂ e	11,917.82

$$BE_{CH_4,y} = ((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y}) \times GWP_{CH_4} \quad (2)$$

Parameter	Description	Unit	01/04/2023-31/12/2023
$BE_{CH_4,y}$	Baseline emissions of methane from the SWDS in year y	tCO ₂ e	83,896.48
$OX_{top,layer}$	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)	/	0.1

$F_{CH_4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year y	tCH ₄	4,280.43
$F_{CH_4,BL,y}$	Amount of methane in the LFG that would be flared in the baseline in year y	tCH ₄	856.09
GWP_{CH_4}	Global warming potential of CH ₄	tCO ₂ e/tCH ₄	28

$$F_{CH_4,PJ,y} = F_{CH_4,EL,y} \quad (3)$$

Parameter	Description	Unit	01/04/2023-31/12/2023
$F_{CH_4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year y	tCH ₄	4,280.43
$F_{CH_4,EL,y}$	Amount of methane in the LFG which is for electricity generation	tCH ₄	4,280.43

$F_{CH_4,EL,y}$ is determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The mass flow of CH₄ shall be determined as follows:

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t} \quad (4)$$

$$\rho_{i,t} = \frac{P_t \times MM_i}{R_u \times T_t} \quad (5)$$

Where:

$F_{i,t}$ = Mass flow of greenhouse gas I in the gaseous stream in the

		interval t (kg gas/h)
$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval t on a dry basis (m^3 dry gas/h)
$v_{i,t,db}$	=	Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m^3 gas i/ m^3 dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/ m^3 dry gas)
P_t	=	Absolute pressure of the gaseous stream in time interval t (101,325Pa)
T_t	=	Temperature of the gaseous stream in time interval t (273.15K)
MM_i	=	Molecular mass of greenhouse gas i (16.04 Kg/kmol)
R_u	=	Universal ideal gases constant (8,314Pa.m ³ /kmol.k)

$$BE_{EC,y} = EC_{BL,k,y} \times EF_{EF,k,y} \times (1 + TDL_{k,y}) \quad (6)$$

$$EF_{EF,k,y} = \omega_{om} X EF_{grid,OM,y} + \omega_{Bm} X EF_{grid,BM,y} \quad (7)$$

$$= 0.5 \times 0.9680 + 0.5 \times 0.4578$$

$$= 0.7129$$

Parameter	Description	Unit	01/04/2023-31/12/2023
$BE_{EC,y}$	Baseline emission from electricity consumption in year y	tCO ₂	11,917.82
$EC_{BL,k,y}$	Quantity of electricity that would be consumed by the baseline electricity consumer k in year y	MWh	16,230.459
$EF_{EF,k,y}$	Emission factor for electricity generation for source k in year y	tCO ₂ /MWh	0.7129

$TDL_{k,y}$	Average technical Transmission and Distribution losses for Providing electricity to source k in year y	/	3%
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$$F_{CH_4, BL, y} = 0.2 \times F_{CH_4, PJ, y} \quad (8)$$

In the monitoring period from 01/04/2023-31/12/2023, the actual monitoring values are shown as follows:

MONTH	$EG_{PJ,y}$	$F_{CH_4, PJ, y}$	$F_{CH_4, BL, y}$
	Monthly quantity of electricity produced using LFG	Monthly methane destroyed	Amount of methane in the LFG that would be flared in the baseline
	kWh	tCH ₄	tCH ₄
Apr-23	1,711,297	451.34	90.27
May-23	1,698,032	447.92	89.58
Jun-23	1,768,419	466.34	93.27
Jul-23	1,691,845	446.28	89.26
Aug-23	1,933,544	510.12	102.02
Sep-23	1,887,403	497.75	99.55
Oct-23	1,871,589	493.66	98.73
Nov-23	1,725,777	454.95	90.99
Dec-23	1,942,553	512.05	102.41
subtotal	16,230,459	4,280.43	856.09

$$BE_y = ((1 - \alpha_{top, layer}) \times F_{CH_4, PJ, y} - F_{CH_4, BL, y}) \times GWP_{CH_4} + EG_{PJ, y} \times EF_{EF, k, y} \times (1 + TDL_{k, y})$$

$$= ((1-0.1) * 4,280.43 - 856.09) * 28 + 16,230.459 * 0.7129 * (1+3\%)$$

$$= 95,814 \text{ tCO}_2\text{e}$$

5.2 Project Emissions

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} \quad (9)$$

Parameter	Description	Unit	01/04/2023-31/12/2023
PE_y	Project emission in year y	tCO ₂	2
$PE_{EC,y}$	Project emissions from electricity consumption in year y	tCO ₂	2

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y}) \quad (10)$$

Parameter	Description	Unit	01/04/2023-31/12/2023
$PE_{EC,y}$	Project emissions from electricity consumption in year y	tCO ₂	2
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project Electricity consumption source j in year y	MWh	1.83
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y	tCO ₂ /MWh	0.7129

$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y	/	20%
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5.3 Leakage Emissions

According to ACM0001, no leakage effects need to be accounted.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

ER_y = Emission reduction in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂e/yr)

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01/04/2023-31/12/2023	95,814	2	0	95,812	0	95,812

The monitoring period covers from 01-April-2023 to 31-December-2023, with totally 275days. Based on the registered VCS PD, the amount of estimated emission reductions for this monitoring period would be 133,834/365*275=100,833tCO₂e. The actual emission reductions in this monitoring period are 95,812tCO₂e, which is 4.98% less than the estimation in the registered VCS PD.

<u>Ex-ante emissions reductions /removals</u>	<u>Achieved emissions reductions /removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>

100,833	95,812	4.98%	For LFG power project, with many external factors affecting the amount and quality of LFG generated, including climate, quantity of domestic waste landfill, waste composition, gas collection efficiency and technology etc, it is reasonable that the amount of LFG generated differs with the estimated value based on hypothetical model given by the tool given by CDM EB. Comparing to the estimated emission reductions, the mainly reasons of the difference are for that: The emission reductions were less than expected due to a decrease in landfill gas collected at the landfill. According to the model, a 4.98% reduction in emission reductions is reasonable.
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APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

The monitoring report does not involve commercially sensitive information.

Section	Information	Justification
/	/	/

APPENDIX 2: <SUPPORTING EVIDENCE>

Supporting evidence for contribution SDG 13

Evidence: Emission reductions achieved during the First Monitoring Period

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (11)$$

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01-April-2023--31-December-2023	95,814	2	0	95,812	0	95,812

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-April-2023--31-December-2023	100,833	95,812	4.98%	For LFG power project, with many external factors affecting the amount and quality of LFG generated, including climate, quantity of domestic waste landfill, waste composition, gas collection efficiency and technology etc, it is reasonable that the amount of LFG generated differs with the estimated value based on hypothetical model given by the tool given by CDM EB. Comparing to the estimated emission reductions, the

				mainly reasons of the difference are for that: The emission reductions were less than expected due to a decrease in landfill gas collected at the landfill. According to the model, a 4.98% reduction in emission reductions is reasonable.
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Source: Section 5.4 of the third Monitoring Report of VCS Project 2353.

Supporting evidence for contribution SDG 8

Evidence: Total number of job opportunitie

序号	所属电厂部门	人员姓名	岗位名称	性别	人员状态	最高学历	年龄
1	青岛电厂	姚红亮	厂长	男	在职	高中	45
2	青岛电厂	刘方栋	运维员	男	在职	大专	42
3	青岛电厂	刘亚勃	运维员	男	在职	大专	39
4	青岛电厂	王恒	运维员	男	在职	大专	34
5	青岛电厂	孙铭宇	运维员	男	在职	大专	29
6	青岛电厂	刘同佳	运维员	男	在职	大专	29
7	青岛电厂	张加兵	收集员	男	在职	高中	34
8	青岛电厂	侯玉林	运维员	男	在职	高中	37
9	青岛电厂	李星	收集员	女	在职	本科	39
10	青岛电厂	徐育杰	收集员	男	在职	大专	36
11	青岛电厂	吴惠飞	收集员	男	在职	大专	37
12	青岛电厂	付艳波	收集员	男	在职	大专	35
13	青岛电厂	刘鹏超	收集员	女	在职	本科	32
14	青岛电厂	孙虹	运维员	男	在职	大专	30
15	青岛电厂	林淑花	会计	女	在职	本科	34

Source: Employee file of Qingdao Baichang Environmental Technology Co., Ltd.

Supporting evidence for contribution SDG 7

Evidence: Affordable and Clean Energy: Qingdao Baichang Environmental Technology Co., Ltd.

MONTH	EG _{PJ,y}	EG _{EC,y}
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	Monthly net quantity of electricity produced using biogas	Monthly electricity from grid to project
	kWh	kWh
<i>01-April-2023- 30-April-2023</i>	1,711,297.00	-
<i>01-May-2023- 31-May-2023</i>	1,698,032.00	-
<i>01-June-2023- 30-June-2023</i>	1,768,419.00	-
<i>01-July-2023- 31-July-2023</i>	1,691,845.00	450.00
<i>01-August-2023- 31-August-2023</i>	1,933,544.00	240.00
<i>01-September-2023- 30-September-2023</i>	1,887,403.00	-
<i>01-October-2023- 31-October-2023</i>	1,871,589.00	-
<i>01-November-2023- 30-November-2023</i>	1,725,777.00	1,140.00
<i>01-December-2023- 31-December-2023</i>	1,942,553.00	-
total	16,230,459.00	1,830.00

Source: Daily operation records from Qingdao Baichang Environmental Technology Co., Ltd.

and receipt of electricity purchase and sales from grid company.