



**Verified Carbon
Standard**

ANHUI ZHUJIXI CMM UTILIZATION PROJECT



ClimateBridge

Project title	Anhui Zhujixi CMM Utilization Project
Project ID	4559
Monitoring period	14-December-2021 to 31-July-2023
Crediting period	14-December-2021 to 13-December-2031
Original date of issue	27-November-2023
Most recent date of issue	10-October-2024
Version	3.2
VCS Standard Version	v4.5
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Anhui Zhujixi CMM Utilization Project (hereinafter referred to as the Project) utilizes the low concentration coal mine methane (CMM) from Zhujixi coal mine to generate hot air to dry coal slime provided by Zhujixi coal mine. The Project is located in Hetuan Town, Panji District, Huainan City, Anhui Province, China. The Project Owner is Huainan Huamei Pushi New Energy Technology Co., Ltd.

Prior to the implementation of the project, Zhujixi coal mine was equipped with CMM extraction facilities and the extracted CMM to be utilized by the project was vented into the atmosphere directly without utilization. Baseline scenario is the same as the condition prior the implementation of the project.

The purpose of the Project is to utilize the extracted CMM with low concentration methane concentration to generate hot air to dry the coal slime. The project applies flameless oxidation process. Four sets of regenerative thermal oxidizers (RTOs), each with a treatment capacity of around 30,000 Nm³/h are installed, able to destroy 10.368 million Nm³ of methane annually and dry 400,000 tonnes of wet coal slime ideally. There are totally six CMM extracting points of the pumping system installed at Zhujixi coalmine. Each of the extracting point is equipped with an independent extracting machine and an independent pipeline, and the concentrations of the extracted CMM are different among the six extracting points. Three out of the six extracting machines supply CMM with a concentration below 8% and around 8% for the project. The other three extract CMM with a concentration higher than 10%, which are used by the electricity generation station out of the project boundary. Only the three extracting points which transport CMM with a concentration below 8% and around 8% are involved in the project boundary. The CMM concentration is diluted to proper concentration by the gas dilution system of the RTOs, ready for flameless oxidation. The thermal energy contained in the hot air generated from RTOs is hard to monitor, so only emission reductions resulting from methane capturing and destruction is claimed for the project.

The emissions reductions of the Project come from methane (CH₄) emission reductions resulting from captured and destroyed CMM in the project scenario, which would have been vented to atmosphere. It is estimated that in the 10 years of crediting period of the project (from 14-December-2021 to 13-December-2031), the expected average annual GHG emission reduction will be 151,088 tCO₂e, with the total emission reduction of 1,510,880 tCO₂e in the 10-year of crediting period.

The project was put into production since 14-December-2021. In this JOINT PD&MR, the monitoring period is from 14-December-2021 to 31-July-2023 (Both days included), with totally 595 days. The actual emission reductions in this monitoring period (595 days) are 115,119 tCO₂e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	/	VCS	China Classification Society Certification Co., Ltd.	/
Verification	14-December-2021 to 31-July-2023	VCS	China Classification Society Certification Co., Ltd.	595 days, i.e. 1.63 years
Total	14-December-2021 to 31-July-2023	VCS	China Classification Society Certification Co., Ltd.	595 days, i.e. 1.63 years

1.3 Sectoral Scope and Project Type

Sectoral scope ¹	Sectoral Scope 8: Mining/mineral production Sectoral Scope 10: Fugitive emissions from fuels (solid, oil and gas)
Project activity type	Non-AFOLU Projects

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 come from capturing and destruction of methane (CH₄) emissions that would have been vented to the atmosphere. Thus, the project is applicable to this scope.
- 2) Ozone-depleting substances: NA
- 3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process: NA
- 4) Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval: The methodology ACM0008 (Version 08) of the project utilized is a methodology approved under CDM Program, that is a VCS approved GHG program.

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>.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements: this project does nothing with REDD+ programs.

6) The project is not assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction. Hence the project aligns with VCS standard 4.5, para 2.1.2: The scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction.

Meanwhile, the project does not belong to the projects excluded 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 as the project is a Non-AFOLU project.

1.4.3 Transfer project eligibility

Not applicable as the project is neither a transfer project nor CPAs seeking registration.

1.5 Project Design

The project is designed as a single location project.

Grouped Project Design

Not applicable as the project is not a grouped project.

1.6 Project Proponent

Organization name	Huainan Huamei Pushi New Energy Technology Co., Ltd
Contact person	ZHEN Long
Title	General Manager
Address	Inside Zhujixi Coal Mine, Hetuan Town, Panji District, Huainan City, Anhui Province, China
Telephone	+86 21 6246 2036
Email	-

1.7 Other Entities Involved in the Project

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the project	Consultancy
Contact person	Gao Zhiwen
Title	General Manager
Address	Block B, Level 24, Jiangong Mansion, 33 Fushan Road, Pudong New Area, Shanghai, China 200120
Telephone	-
Email	gao.zhiwen@climatebridge.com

1.8 Ownership

The project owner of the project is Huainan Huamei Pushi New Energy Technology Co., Ltd. The approval of Environmental Impact Assessment (EIA), Feasibility Study Report (FSR), and the business license of the project owner are evidence for legislative right.

1.9 Project Start Date

Project start date	14-December-2021
Justification	On 14-December-2021, the project was put into use and started to destroy CMM for the coal mine. So, this is the date on which the project began generating GHG emission reductions.

1.10 Project Crediting Period

Crediting period	Ten years, fixed
Start and end date of first or fixed crediting period	Start date: 14-December-2021 End date: 13-December-2031

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals (ERRs) of the project is < 300,000 tCO₂e/year (project).

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO ₂ e)
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14- December -2021 to 31-December-2021	7,451 ²
01- January -2022 to 31-December-2022	151,088
01- January -2023 to 31-December-2023	151,088
01- January -2024 to 31-December-2024	151,088
01- January -2025 to 31-December-2025	151,088
01- January -2026 to 31-December-2026	151,088
01- January -2027 to 31-December-2027	151,088
01- January -2028 to 31-December-2028	151,088
01- January -2029 to 31-December-2029	151,088
01- January -2030 to 31-December-2030	151,088
01- January -2031 to 13-December-2031	143,637 ³
Total estimated ERRs during the first or fixed crediting period	1,510,880
Total number of years	10
Average annual ERRs	151,088

1.12 Description of the Project Activity

The project started construction on 01-June-2021 and put into use since 14-December-2021. The project is expected to operate 7200 hours annually, in consideration of necessary repairs. And the lifespan of the project is planned to be 10 years (excluded the construction phase).

Within the lifespan, four sets of RTOs, each with a gas treatment capacity around 30,000Nm³/h, is supposed to destruct 10.368 million Nm³ of methane per year.

The technical process of the Project is shown in Figure 1. The low concentration CMM (e.g. gas flow containing below 8% and around 8% methane) is delivered by methane extraction pumps to oxidation system, mainly including automatic control cabinet, ventilators and RTOs. The system automatically adjusts methane content in the gas flow to the appropriate concentration (about 1.2%) by using the ventilators for subsequent oxidation, and then the gas flow goes into the main installations of the oxidation system, RTOs, for hot air generation. The oxidation system can

² It is covering 18 days from 14-December-2021 to 31-December-2021, thus the estimated emission reduction in the period is 7,451 tCO₂e, ie.7,451 tCO₂e = 151,088tCO₂e x 18days/365days.

³ It is covering 347 days from 01-January-2031 to 13-December-2031, thus the estimated emission reduction in the period is 143,637 tCO₂e, ie.143,637 tCO₂e = 151,088tCO₂e x 347days/365days.

control the whole process under safety level. After that, the gas flow with high temperature goes into coal slime dryer. The technical flow is as shown in Figure 1. Detailed monitoring information can be found in section 5.3.

Actually, the emission reductions of the project come from two sources: 1) Methane (CH_4) destroyed in the project scenario, which would have been vented without utilization in baseline scenario; 2) CO_2 emission reductions from producing equivalent amount of hot air replaced by the Project that would otherwise have been generated by coal-fired hot blast stove. However, the thermal energy contained in the hot air is hard to monitor. As result, the emission reductions from source 2 is not claimed for conservative consideration. Only ERs from capturing and destroying methane are claimed.

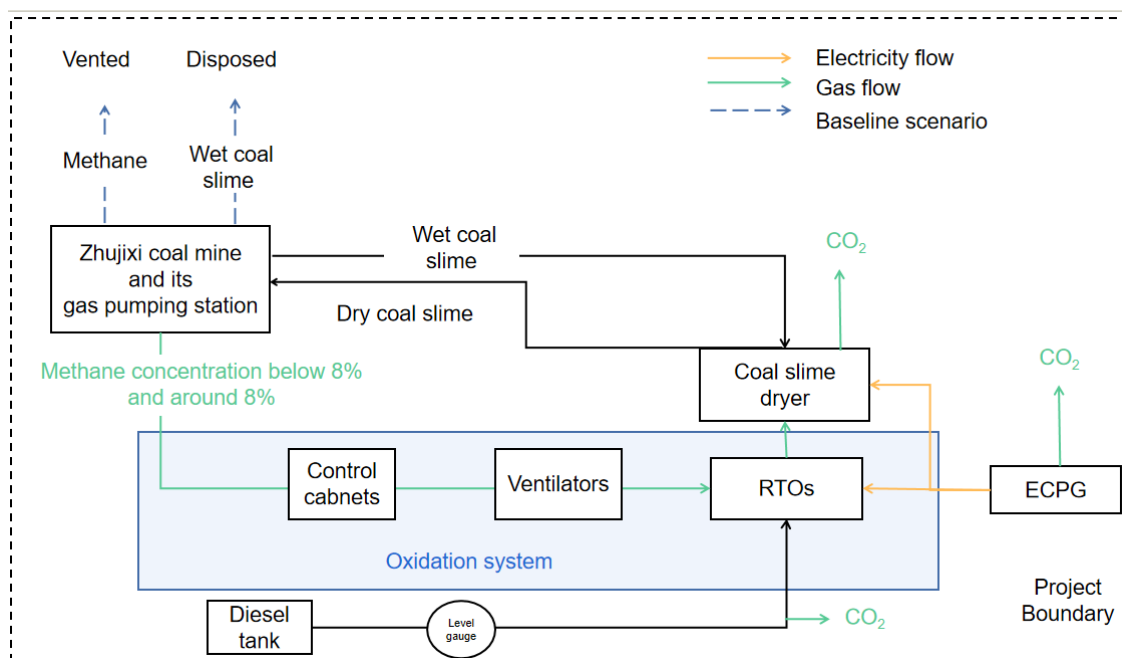


Figure 1 Technical flow chart of the project activity

Table 1 RTO Specifications

Product model	2001.0030
Supplier	Shandong ComeRiver Power Technology Company Ltd.
Quantity	4
Gas treatment capacity (Nm ³ /h)	30000~33000Nm ³ /h
Lowest gas concentration entering the RTO (%)	0.5%

Gas concentration for stable working (%)	1.0~1.1%
Power supply requirement	380V/50Hz, 110kW
Oxidation rate (%)	>=95

1.13 Project Location

The Project is located in Hetuan Town, Panji District, Huainan City, Anhui Province in China. The geographical coordinates for the project site are 116°42'35.32"E, and north latitude 32°54'48.59"N. The geographic location of the project is shown in Figure 2.

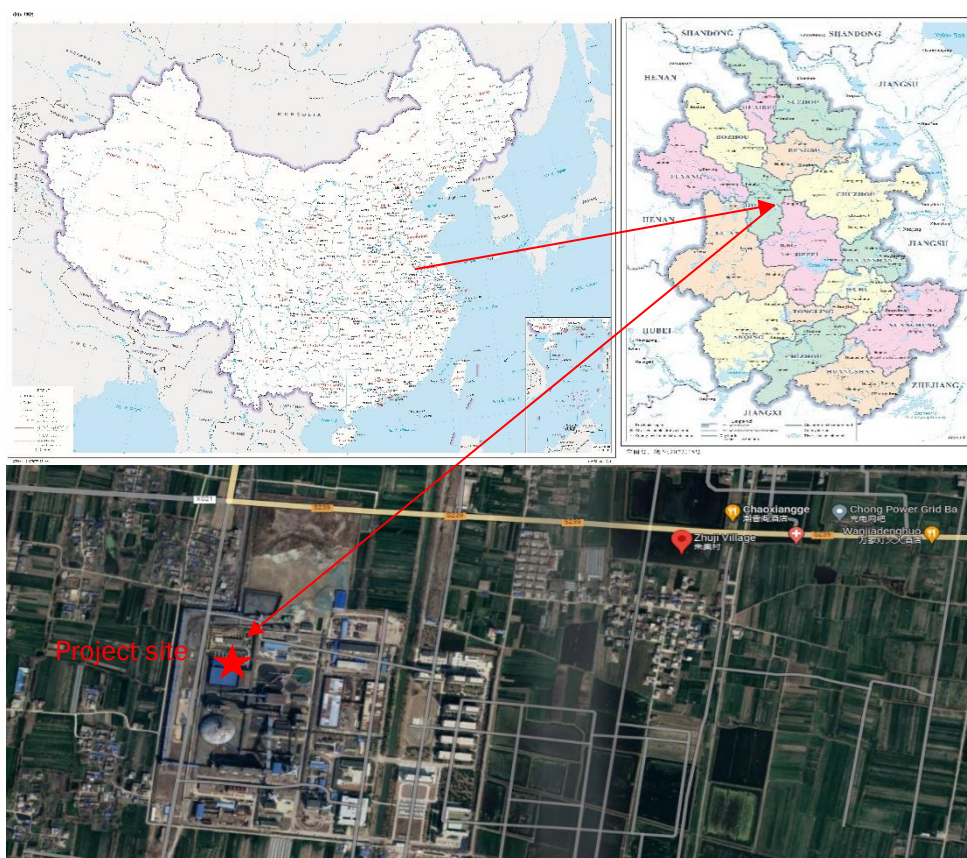


Figure 2 Location of the project

1.14 Conditions Prior to Project Initiation

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

The low concentration CMM extracted from the Zhujixi coal mine, which is utilized in the project scenario, would be vented into the atmosphere without utilization.

The baseline scenario is the same as the scenario existing prior to the implementation of the project activity, please refer to Section 3.4 (Baseline Scenario).

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project complies with all Chinese relevant laws and regulations. Mainly include:

1. Opinions of the General Office of the State Council on Further Accelerating the Extraction and Utilization of Coalbed Methane (Coal Mine Gas)⁴;

According to the paragraph 3 article 8 of this regulation, in order to adapt to the new situation of coal mine gas prevention and control and the development of coalbed methane industrialization, State encourage the CMM utilization for energy generation. Thus, this project belongs to the field encouraged by the State and complies with this regulation.

2. Chinese National Coalmine Safety Regulation⁵;

In order to reduce the occurrence of major accidents in coal mines, the government has formulated these regulations. This project uses coal mine gas to generate energy, effectively utilizes coal mine gas and reduces the risk of coal mine explosion, so the project complies with this regulation.

3. Notice of the National Development and Reform Commission on the issuance of the twelfth Five-Year Plan for The Development and Utilization of Coalbed Methane (Coal Mine Gas)⁶.

In order to speed up the development and utilization of coalbed methane (coal mine gas), ensure the safe production of coal mines, increase the supply of clean energy, promote energy conservation and emission reduction, this Notice was published. This project utilizes the coal mine gas for energy generation, which complies with this Notice.

The project obtained the approval letters from governmental authorities: Huainan City Panji district Development and Reform Commission, as well as Huainan City Environmental Protection Department. The two approvals well demonstrate that local government permits the construction of the project. Consequently, the project is compliance with laws, status and other regulatory frameworks.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

⁴ http://www.gov.cn/zhengce/content/2013-09/18/content_2540.htm

⁵ <https://www.mem.gov.cn/fw/flfgbz/gz/>

⁶ https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/201112/t20111231_962121.html

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

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

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

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

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

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 proponent is not part of any emission trading program. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs.

China has a national emissions trading scheme only cover the high-emission industries that emit at least 26,000 tons of (eg. petrochemical, chemical, building materials, iron and steel, non-ferrous, paper, aviation) CO₂e/year, not including renewable project⁷. And the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner according to the enforced company list in public information⁸. The project did not register or applied for registration under the Chinese Pilot Market for Carbon Trading. The Chinese Pilot Market for Carbon Emission Trading built 7 pilot markets for carbon trading in 2011 in Beijing City, Shanghai City, Tianjin City, Chongqing City, Guangdong Province, Hubei Province and Shenzhen City⁹. The project locates in Anhui Province, which was not part of the pilot markets.

⁷ https://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html

⁸ http://sthjt.zj.gov.cn/art/2021/12/16/art_1229263559_4843729.html

⁹ https://www.gov.cn/xinwen/2021-08/03/content_5629115.htm

Furthermore, the project does not register or applies for registration under the Chinese Carbon Trading Market, which replaces the pilot market since 2021.

Hence, it is confirmed that the emission reductions will not be double counted.

1.17.2 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

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes

☒ No

As per CLARIFICATION TO VCS PROGRAM RULES AND REQUIREMENTS, published on 31 MAY 2023¹⁰, the following demonstration is effective:

“Sections 3.23.7 through 3.23.9 have been added to require public statements to help avoid double claiming of emissions reductions and removals in Scope 3 emissions inventories. These sections will be revised in the next version of the VCS Standard, with an effective date of 1 January 2024.”

1.18 Sustainable Development Contributions

1.18.1 Sustainable Development Contributions Activity Description

A summary description of project activities that result in sustainable development (SD) contributions:

Project is to utilize the extracted CMM with low concentration methane concentration to generate hot air to dry coal slime, which has positive impact to climate and also provide jobs.

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

- The project will achieve a GHG emission reduction of 151,088tCO₂e/year during the whole crediting period. Thus, the project will achieve Target 13.2 under SDG 13 “Take urgent action to combat climate change and its impacts”.

¹⁰ <https://verra.org/verra-issues-clarification-on-effective-date-of-vcs-scope-3-requirements/>

- This project will increase income of local residences and accelerate economy development in rural areas. During the crediting period, direct and indirect employment opportunities will be generated. Thus, the project will achieve Target 8.5 under SDG 8 “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”.

1.18.2 Sustainable Development Contributions Activity Monitoring

SDG Goal	Target	Chinese sustainable development priorities	Project activity contribution
	13.2 Integrate climate change measures into national policies, strategies and planning ¹¹ .	Published in October 2022, China's Climate Change Policy and Action 2022 Annual Report ¹² pointed out that China will actively control non-carbon dioxide greenhouse gas emissions from energy, agriculture, waste and other major sources of emissions. The central government is editing “Methane emission control action scheme”	The project utilizes the extracted CMM with low concentration methane concentration to produce hot air to avoid methane emissions. This contributes to methane emission control.
	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value ¹³ .	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	The project activity can provide employment opportunities for the operation of the project activity. This contributes to one of China’s actions for promoting sustainable developing: "by 2030, achieve full and productive employment and decent work for all women and men,

¹¹ <https://sdgs.un.org/goals/goal13>

¹² <https://www.mee.gov.cn/ywgz/ycqhbh/syqhbh/202210/W020221027551216559294.pdf>

¹³ <https://sdgs.un.org/goals/goal8>

		growth in 2020 and has made positive contributions to the recovery of the global economy.	including for young people and persons with disabilities, and equal pay for work of equal value”.
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Table 2: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	8.5	The number of the job opportunities provided by the implementation of the project	Implemented activities to increase	Provided 20 employment positions for local residents.	Has provided 20 employment positions in the reporting period.
2)	13.2	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to decrease	Lowered the GHG emissions 115,119 tCO ₂ e by destroying CH ₄ during this monitoring period	Has prevented the release of 115,119 tonnes of carbon into the atmosphere

1.19 Additional Information Relevant to the Project

Leakage Management

According to the methodology, the leakage of the project is zero, thus the leakage management is not applicable to the project.

Commercially Sensitive Information

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

Further Information

No further information.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

The following steps were chosen to identify stakeholders:

Step 1: Brainstorm with key informants or focus groups to list and classify stakeholders

This brainstorm starts by listing all the people or groups who might be impacted by a project.

Residents in Hetuan County

Hetuan county has been identified as the project zone which will be impacted by the project activity as shown in the description above.

Workers in Zhujixi coal mine

Workers in the coal mine are identified as possible stakeholders because their working environment is close to the project activity.

	Step 2: Clarify the geographical range of stakeholders involved in the project <i>Residents in Hetuan County</i> Residents cannot enter the gate of the coal mine. Thermionically, the impacted of the project is limited in the range of the Zhujixi coal mine because it is located within the coal mine. But the Environmental Impact Assessment report pointed out that the project might has an impact on air environment within 500 meters away from the project site. So residents live around 500 meters away from the project site in Hetuan County are identified as stakeholders of this project. <i>Workers in Zhujixi coal mine</i> Some of the workers of Zhujixi coal mine live in the dormitories of the coal mine, which means they can be influenced by the project. So all the workers in the Zhujixi coal mine are identified as stakeholders of this project. Among them, there are general workers (identified as “worker”), experts (identified as “expert”) and management personnel (identified as “management personnel”). Local residents can be workers of the Zhujixi coal mine at the same time. How to identify their classification depends on their personal willing. If the stakeholder are not willing to reveal their identity, they are identified as “unspecified”. In conclusion, people 500 meters away from the project boundary and all workers (e.g. workers, farmers, experts and management personnel, unspecified) including males and females, are stakeholders of this project.
Legal or customary tenure/access rights	The government gives the legal right to the project owner to access the stakeholders and consider their advice¹⁴. On the other hand, people are voluntary to participate the consultation.

¹⁴ https://www.gov.cn/gongbao/content/2018/content_5338231.htm

Stakeholder diversity and changes over time

As identified above, stakeholder groups of this project include residents in Hetuan county and workers of Zhujixi coal mine.

Culture

Most of workers of Zhujixi coal mine are hired nearby. So there is no obvious difference between the two groups.

Within each group, there is no obvious significant cultural diversity identified.

Society

The social diversity mainly includes the differences of age, education and occupations. The workers of Zhujixi coal mine is in the range of legal enforcement which is between 16 and 60/55 (male/female) years old. From the public recruitment information, workers of the coal mine at least have accepted junior high school education. Experts and management personnel might be people who accept higher education or older. But it's not absolute.

Residents mostly are farmers. There are also students and freelance work. It seems that ages of residents locates in the range of over 45 and below 25. The reason might be that young and middle-aged labor force prefer to seek for job outside the county or are hired by the Zhujixi coal mine.

The age, education and occupation structure above are stable and has little trends to change because the local economic development relies on the coal mine relevant industries and agriculture. The labour composition is hardly to change.

Economy

The salary of stakeholder groups is different. According to Huainan Statistical Yearbook which reports the data in 2021¹⁵, farmers' average annual salary is lower than coal mine workers' average annual salary. Management people and experts in relative field has an annual salary over the average level. Residents who are students or do not have

¹⁵ <https://tjj.huainan.gov.cn/tjsj/tjnj/551653442.html>

	jobs do not have salary. Farmers may look for jobs in the coal mine for higher payment. And within “unspecified” people, some of them do not have a job with income.
Expected changes in well-being	Job opportunities and poverty focal issue: The project is estimated to offer 20 full-time job opportunities to local residents. After the implementation of the project, the ratio of poor households is expected to decrease due to the increase of income; there will also be opportunities for local residents who would otherwise leave their home for big cities for work, allowing them to stay with their family and these job opportunities would give them the chance and motivation to meet each other and to organize more social activities, that will increase the interaction within the community. All these will significantly improve the well-being of local communities.
Location of stakeholders	Stakeholders are located around 500 meters away from the project boundary, as well as within the whole coal mine.
Location of resources	Territories and resources occupied by the project is within the range of Zhujixi coal mine, where no identified stakeholders legally own or use.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	23-April-2021								
Stakeholder engagement process	The Project owner invited local stakeholders in both oral (i.e. telling stakeholders including all genders who passed by to participate in) and written way (i.e. posting announcements on the bulletin boards). The oral way of invitation used the local language for those illiterates. And the announcements were written in a straightforward way which can be easily understood. the project owner carried out 50 questionnaire survey for the local stakeholder to collect the relevant comments and suggestions. The structure of the survey respondents is listed in table below. <table><tr><th>Item</th><th>Distribution</th><th>Quantity</th><th>Percentage</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Item	Distribution	Quantity	Percentage				
Item	Distribution	Quantity	Percentage						

	Amount of stakeholders surveyed	Male	25	50%
		Female	25	50%
	Age	<25	6	12%
		25-45	22	44%
		45-55	17	34%
		>55	5	10%
	Education	Junior high school or below	22	44%
		Senior high school	20	40%
		College or above	8	16%
	Occupation	Worker	15	30%
		Farmer	20	40%
		Management personnel	5	10%
		Expert	3	6%
		Unspecified	7	14%

Consultation outcome	Fifty questionnaires were distributed to local stakeholders, and all questionnaires have been recollected. Comments from these questionnaires are summarized below:				
	No.	Questions	Attitude or Opinion	Amount	Percentage
	1	Do you know about the project?	Quite much	25	50%
			Heard of	20	40%
			Nothing	5	10%
	2	What is your attitude towards the project construction?	Supportive	45	90%
			Against	0	0%
			Indifferent	5	10%
	3	What is the most probable environmental impact do you think the project will cause after the construction finish (multiple choice)?	None	40	80%
			Air pollution	0	0%
			Water pollution	2	4%
			Noise pollution	3	6%
			Harm to indigenous	0	0%

4	Do you think the project operation will bring about more benefits than loss?		animals and plants		
			No idea	5	10%
			Yes	50	100%
			No	0	0%
			About the same	0	0%
5	Are you willing to participate in the project construction or operation?		Yes	40	80%
			No	5	10%
			Indifferent	5	10%
6	What influence do you think the project will bring about to you and your family?		Positive	40	80%
			None	10	20%
			Negative	0	0%
7	Do you think the project operation will affect the production safety of the coal mine?		Positive effect	40	80%
			None	10	20%
			Negative effect	0	0%
8	What impact do you think the project will bring to local community? (multiple choice)	Employment	Positive effect	50	100%
			None	0	0%
			Negative effect	0	0%
		Economy	Positive effect	46	92%
			None	0	0%
			Negative effect	4	8%

The survey shows that the Project is well known by local residents. Most of respondents know or hear about the Project. Most of them are supportive of the project construction and think the Project will bring more benefit than loss. 80% of the respondents are willing to participate in the construction and operation of the Project.

80% of the respondents believe that the Project will not have any environmental impact, but there are a few respondents who show their concern about the potential noise pollution and water pollution caused by the Project. For both issues, the project owner will adopt some measures to mitigate the pollution. For the noise pollution: The noise

	mainly comes from the noise generated by the drying system, including twin-shaft crushing feeder, dryer and cyclone dust collector. The project will use sound insulation walls to reduce the impact of noise on the surrounding area. Noise emission from the project operation complies with the standard requirements of Category 2 of “Emission standard for industrial enterprise noise at boundary” (GB12348-2008), and the environmental noise at the residential settlement satisfies Category 2 of “Environmental quality standard for noise” (GB3096-2008). For the water pollution: The wastewater mainly comes from ground washing wastewater, and the generated wastewater is mainly SS, which is treated in the concentration tank and recycled without being discharged. 80% of the respondents recognize the positive impact of the Project on individuals and families. They think the Project will improve the local employment and increasing the residential income, thus greatly reducing family burden. No one thinks that the Project will have a negative impact on the local life. In the aspect of coal mine production safety, 20% of the respondents believe the Project will not have any impact on coal mine safety, and 80% of the respondents consider the Project improve the operational safety of the coal mines to some extent. 8% of the respondents think that the project does no good to the local economic environment. The main reason is that they are afraid of coal price will increase. The project owner answers, the coal slime drying contributes to increase the amount of qualified coal. So the project will not impact the coal price. The respondents felt satisfying to the answer. In general, local stakeholders are supportive of the project construction. The survey shows that a majority of local stakeholders think the Project will help improve the life of local people and promote local economic development without much adverse environmental impact. The survey shows that almost all of the stakeholders are supportive to the proposed project, believing that the Project will provide more employment opportunities, help local economic development. Therefore, the implementation of the Project is regarded as beneficial by most of the local stakeholders.
Ongoing communication	In order to understand the opinions of various stakeholders during the project operation period, the project owner will set up an on-going communication mechanism to regularly holds stakeholder meetings every year to issue questionnaires and to answer the questions from various stakeholders

Stakeholder input	In this first monitoring period, the project owner carried out 20 questionnaire survey for the local stakeholder to collect the relevant comments and suggestions in 06-November-2022. There are no negative comments received for the project. No change to the project design by far.
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2.1.3 Free Prior and Informed Consent

Obtaining consent	The project signed an agreement with the Zhujixi coal mine in December, 2021. They achieved agreement on the project implementation (e.g. CMM supply and usage, wet coal slime supply and usage). And then the project owner entrusted a third party, Anhui Sike Environmental System Engineering Technology Co., Ltd. to conduct the Environmental Impact Assessment (EIA) of the project. The EIA report was completed in April 2021 and was approved by Huainan City Panji District Environmental Protection Bureau on 25-May-2021, with approval Panhuanshenfu[2021] No.5. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project development, and no net harm has been detected.
Outcome of FPIC	Before construction, the project obtained the approval letters from governmental authorities: Huainan City Panji district Development and Reform Commission, as well as Huainan City Environmental Protection Department. The project got approval from Huainan City Panji district Development and Reform Commission on 29-December-2020 (project code:2012-340406-04-05-861286).

2.1.4 Grievance Redress Procedure

Development process	Stakeholders can access the official website of Huainan City Panji District Environmental Protection Bureau ¹⁶ or directly call to reflect, report any problems or give their advice anytime. The project proponent has nominated a specific staff in charge of recording and collecting conflicts
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¹⁶ <https://sthjj.huainan.gov.cn/zmhd/zxjy/index.html>

	and grievances of local communities, and the relevant solution process is as follows.
Grievance redress procedure	Firstly, once getting the complaints or grievances, project proponent shall contact and discuss with relevant community or other stakeholders within 3 days; then the specific staff of project proponent should propose a solution and mediation which is performed by relevant government agency within a week based on all collected information; Thirdly, the project proponent will address their complaints or grievances by relevant legal method such as arbitration and courts if necessary. Finally, the entire complaints or grievances redress process shall be dealt within 30 days.

Reporting on the official website or calling directly are the most effective ways to solve the problems because stakeholders can reach the reflection portals anytime anywhere, and face no barrier or pressure to report the problems without leaving their name or showing face.

Grievances received	Resolution and outcome
NA	NA

2.1.5 Public Comments

This project was open for public comment from 23/08/2023 to 22/09/2023 and received no public comment.

Comments received	Actions taken
NA	NA

2.2 Risks to Stakeholders and the Environment

	Risks identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	Stakeholders are free to reach the reflection portals anytime anywhere and face no barrier or pressure to report the problems without leaving their name or showing face.

Working conditions	No risk identified	Workers entering the project site must wear safety helmet and overalls. And the safety training are provided every year.
Safety of women and girls	No risk identified	Article 12 of Labour Law of the People's Republic of China enforces: Labourers, regardless of their ethnic group, race, sex, or religious belief, shall not be discriminated against in employment. The project proponent obeys the anti-discrimination rules set out in the law
Safety of minority and marginalized groups, including children	No risk identified	Article 12 of Labour Law of the People's Republic of China enforces: Labourers, regardless of their ethnic group, race, sex, or religious belief, shall not be discriminated against in employment. And article 15 enforces: The employing units are prohibited from recruiting minors under the age of 16. The project proponent strictly obeys the law.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	The Project owner entrusted the qualified third-party Anhui Sike Environmental System Engineering Technology Co., Ltd. to complete the Environmental Impact Assessment (EIA) report in April 2021. The EIA report was approved by Huainan City Panji District Environmental Protection Bureau on 25-May-2021. The environmental impacts of the project in construction period and in operation period are summarized as follows. Construction period Air pollution: Air pollution is mainly dust from transporting and handling of materials, and placement of equipment. The generated dust is very small. The vehicles for transporting materials are covered by cloth. There is temporary fencing around the project site to limit the expansion of the dust. After such dust reduction measures are taken, the dust has little impact on the environment. Wastewater pollution: The wastewater mainly comes from concrete mixing wastewater. After the concrete mixing wastewater is settled in the sedimentation tank, all the wastewater is reused as construction wastewater and is not discharged. Noise pollution: Sound pollution is mainly caused by the operation of equipment. The project will take the following measures to control construction noise: select low-noise construction equipment; build walls to provide sound insulation; the project is only scheduled for construction

	during the day and does not affect the lives of surrounding residents. Solid waste pollution: Solid waste mainly comes from construction waste, such as concrete blocks, broken bricks, wood, and domestic waste. Construction waste is backfilled in the empty space of the industrial site, and then hardened after backfilling; the generated domestic waste is collected in a special trash bin and transported to the designated location. Operation Period Air pollution: Air pollution comes from the dust generated by drying wet slime. The drying system of this project is in a negative pressure state to prevent dust leakage, and the dried exhaust gas is treated with a cyclone dust collector to treat the particulate matter, and the generated exhaust gas is exhausted through a 15-meter exhaust. Wastewater pollution: The wastewater mainly comes from ground washing wastewater, and the generated wastewater is mainly suspended solids, which is treated in the concentration tank and recycled without being discharged. Noise pollution: The noise mainly comes from the noise generated by the twin-shaft crushing feeder, dryer and cyclone dust collector. The project will use sound insulation walls to reduce the impact of noise on the surrounding area. Solid waste pollution: The solid waste is mainly the dust collected by the dust collector and domestic wastes generated by staff. A storage room is set up in this project to classify the wastes. In conclusion, through the above measures by the project owner, there are no negative environmental impacts due to the project
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	Article 12 of Labour Law of the People's Republic of China enforces: Labourers, regardless of their ethnic group, race, sex, or religious belief, shall not be discriminated against in employment. Article 40 of Law of People's Republic of China for the Protection of Women's Rights and Interests
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	enforces: Sexual harassment of women is prohibited. Women victims have the right to complain to their units and relevant authorities. The project proponent strictly obeys the anti-discrimination rules set out in the law. No discrimination or sexual harassment has occurred or will occur.
Management experience	The project owner, Huainan Huamei Pushi New Energy Technology Co., Ltd. has the business scope of business management and they have previous experience on the similar project. Meanwhile, the project owner continuously learns from Zhujixi Coal Mine Labour Union to earn more similar experience.
Gender equity in labor and work	Chapter IV Labor and Social Security Rights and Interests of Law of People's Republic of China for the Protection of Women's Rights and Interests provide the legal enforcement for gender equity in labour and work. The project proponent strictly obeys the law.
Human trafficking, forced labor, and child labor	All the labour is hired from normal paths. Labourers have the right to resign anytime. Article 15 of Labour Law of People's Republic of China enforces: The employing units are prohibited from recruiting minors under the age of 16. The project proponent strictly obeys the law.

2.3.2 Human Rights

The project strictly follows the Labour Law of in line with People's Republic of China. The legal rights and interests of all employees are protected. No indigenous peoples or tribal peoples are treated differently from the majority of local people..

2.3.3 Indigenous Peoples and Cultural Heritage

N/A as the territories and resources occupied by the project is within the range of Zhujixi coal mine, where no indigenous peoples and cultural heritage involved.

2.3.4 Property Rights

Rights to territories and resources	Territories and resources occupied by the project is within the range of Zhujixi coal mine, where no identified stakeholders legally own or use Zhujixi coal mine.
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Respect for property rights

The project have achieved agreement with Zhujixi coal mine on the supply and usage of CMM.

2.3.5 Benefit Sharing

Not applicable as the no benefit sharing event is involved in the project.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure taken
Impacts on biodiversity and ecosystems	No risk identified	The land occupied by the project is within the range of Zhujixi coal mine. The land belongs to construction land. And the EIA report identifies there is no impacts on biodiversity and ecosystems.
Soil degradation and soil erosion	No risk identified	The land occupied by the project is within the range of Zhujixi coal mine. The land belongs to construction land. And the EIA report identifies there is no impacts on soil degradation and soil erosion.
Water consumption and stress	No risk identified	The EIA report claims that “The wastewater is treated by Zhujixi sewage treatment Station and used in Zhujixi coal mine preparation Plant, and no wastewater is discharged,”
Usage of fertilizers	No risk identified	No fertilizers are used in the project.

2.4.1 Rare, Threatened, and Endangered species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes

☒ No

As per the EIA report, the project's location does not involve any habitats for rare, threatened, or endangered species.

2.4.2 Introduction of species

N/A as the project does not plant or introduce any species.

2.4.3 Ecosystem conversion

N/A as the project is a non-AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0008	Abatement of methane from coal mines	08.0
Tool	Tool02	Combined tool to identify the baseline scenario and demonstrate additionality	07.0
Tool	Tool03	Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion	03.0
Tool	Tool05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0
Tool	Tool08	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	3.0
Tool	Tool24	Common practice	3.1
Tool	Tool27	Investment analysis	12

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
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ACM0008	This methodology applies to project activities that aim for the use and/or destruction of the methane extracted/obtained from a working or abandoned coal mine(s). The project activities include any of the following methods to treat the methane captured: (a) The methane is destroyed without energy production, for example through flaring; (b) The methane is used to produce energy. This may include electricity, heat, vehicle fuel, etc.	Applicable. The project uses the low concentration coal mine methane (CMM) from Zhujixi coal mine for hot air generation to dry coal slime. Therefore, the project is applicable to condition (b).
	Emission reductions can be claimed for displacing or avoiding energy from other sources	Applicable. The emissions reduction of the project comes from two sources: 1) Methane (CH₄) destroying in the project scenario, which would have been vented without utilization in baseline scenario; 2) CO₂ emission reductions from producing equivalent amount of hot air replaced by the Project that would otherwise have been generated by coal-fired hot blast stove. However, the emission reduction from source 2 is not claimed. Only ERs from destroying methane are claimed.
	Methane used in the project activities shall be extracted using the following techniques: (a) Surface drainage boreholes to capture coal bed methane (CBM) or methane from open cast mines;	Applicable. The project uses CMM from 'Underground boreholes in the mine to capture pre mining CMM' and 'surface goaf well, underground

	(b) Underground boreholes in the mine, surface goaf wells, underground boreholes, gas drainage galleries or other goaf gas capture techniques, including gas from sealed areas, to capture coal mine methane (CMM); (c) Mine ventilation system to dilute and remove ventilation air methane (VAM); (d) Surface drainage boreholes in the case of sealed abandoned mines or ventilation system in the case of ventilated mines to capture abandoned mine methane (AMM).	boreholes, gas drainage galleries or other goaf gas capture techniques, including gas from sealed areas, to capture coal mine methane (CMM)'. The Project activity does not involve the extraction or utilization of CBM, VAM or AMM. Therefore, the project is applicable to condition (b).
	The remaining share of the methane, to be diluted for safety reason, may still be vented.	Applicable. The project involves the capture and utilization of CMM for energy use at the operational Zhujixi coal mine where the baseline is the total atmospheric release of the methane. The remaining unused share of the methane is vented for safety reasons.
	In the case of open cast mines, in addition to the conditions listed above, project activities should meet the following requirements: (a) The mines should have had a working mining concession for at least three years prior to the start of project; (b) Only pre-mining drainage from wells placed within the area to be mined are eligible for crediting; (c) For the calculation of emission reductions, all provisions for CBM should be followed for the open cast mine methane.	Not relevant. The Zhujixi coal mine the project involved is not a case of open cast mine.
	The methodology does not apply to project activities with any of the following features:	Not relevant.

	(a) Capture/use of virgin coal bed methane, e.g. methane extracted from coal seams for which there is no valid coal mining concession; (b) Use CO₂ or any other fluid/gas to enhance CBM drainage before mining takes place; (c) Methane extraction from abandoned mines that are flooded due to regulation.	The project does not involve the extraction or utilization of CBM. The project does not use CMM from open cast mining, or abandoned mines.
	The methodology does not apply to project activities that involve use and/or destruction of CBM or OCM if the baseline scenario identification resulted in partial use and/or destruction of CBM or OCM.	Not relevant. The project does not involve use and/or destruction of CBM or OCM.
	Emission reductions due to the use and/or destruction of CBM or OCM cannot be claimed if surface drainage to capture CBM or methane from open cast mine(s) is used within the project boundaries prior to the implementation of the project activity.	Not relevant. The project does not involve use and/or destruction of CBM or OCM.
Tool02	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 is a CMM utilization project. And ACM0008 (version08.0) refers to this tool.
Tool03	This tool provides procedures to calculate project and/or leakage CO₂ emissions from the combustion of fossil fuels. It can be used in cases where CO₂ emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its	Applicable. The RTOs needs burning diesel to ignite at the start.

	properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.	
Tool05	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 (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.	Applicable. The electricity is purchased from the grid only, and no captive power plant(s) is/are installed at the site of electricity consumption. So the project is in accordance with scenario A.
	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	Not relevant. This tool is used to calculate the emission of electricity

	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.	consumption in project scenario, not to monitor amount of electricity generated.
	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 CO₂ emissions.	No captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage.
Tool08	Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions.	Applicable. The volumetric flow of the gaseous stream and volumetric fraction of greenhouse gas CH₄ will be measured by the project.
	Methodologies where CO₂ is the particular and only gas of interest should continue to adopt material balances as the means of flow determination and may not adopt this tool as material balances are the cost-effective way of monitoring flow of CO₂	Not relevant. For the project, CO₂ is not the particular and only gas. The CH₄ is the main gas in the landfill gas for the project
	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	Applicable. (a) The methodology has specified (a) to (d).

	of the gaseous stream (equations (3) or (17)) is not valid (such as the gaseous stream is predominantly composed of a gas other than N ₂).	
Tool24	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.	Since the project activity is using “Combined tool to identify the baseline scenario and demonstrate additionality”, the tool is applicable.
	In case the applied approved baseline and monitoring 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.	Applicable. The baseline and monitoring methodology refers to “Combined tool to identify the baseline scenario and demonstrate additionality”. It required that the latest version of the “Methodological tool: Common practice” available on the UNFCCC website shall be applied. Therefore, this tool is applicable.
Tool27	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	Applicable. Since the project activity is using “Combined tool to identify the baseline scenario and demonstrate additionality”, the tool is applicable.

	of additionality and/or the identification of the baseline scenario.	
	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 baseline and monitoring methodology refers to “Combined tool to identify the baseline scenario and demonstrate additionality”. Therefore, this tool is applicable.

3.3 Project Boundary

As per ACM0008 (08.0) The spatial extent of the project boundary comprises:

- (a) The coal mine from where the methane is extracted;

For the project, Zhujixi coal mine is the coal mine from where the methane extracted.

- (b) All equipment installed and used for the extraction, purification, compression, and storage of methane and transport to an off-site user;

For the project, there is no equipment for compression, CMM storage and transport to off-site user. Facilities for CMM drainage and extraction were installed prior to the implementation of the project activity. They are owned by the coal mine and are used primarily to maintain underground mining safety. Since they are not installed and used as part of the project activity, they are not considered in both the investment analysis and baseline calculations. There are totally six CMM extracting points of the pumping system installed at Zhujixi coalmine. Each of the extracting point is equipped with an independent extracting machine and an independent pipeline, and the concentrations of the extracted CMM are different among the six extracting points. Three out of the six extracting machines supply CMM with a concentration below 8% and around 8% for the project. The other three extract CMM with a concentration higher than 10%, which are used by the electricity generation station out of the project boundary. Only the three extracting points which transport CMM with a concentration below 8% and around 8% are involved in the project boundary.

- (c) Facilities that are installed and used as part of the project activity for flaring, flameless oxidation, captive power and heat generation, gas production and transportation;

For the project, CMM delivery system, RTOs installed and used in the Project are considered.

- (d) Power plants connected to the electricity grid, where the project activity exports power to the grid and emission reductions are claimed for the displacement of grid emissions, as per the definition of project electricity system and connected electricity system given in the latest version of the “Tool to calculate the emission factor for an electricity system”.

The diagram illustrates the coal slime drying system with the following components and flows:

- Zhujixi coal mine and its gas pumping station:** Receives Methane (vented) and Wet coal slime (disposed). It sends Dry coal slime to the Coal slime dryer.
- Coal slime dryer:** Receives Wet coal slime from the mine and the ECPG. It emits CO₂ and sends material to the RTOs.
- Oxidation system (blue box):** Contains Control cabinets, Ventilators, and RTOs. It receives input from the Diesel tank (via a Level gauge) and the RTOs. It sends material to the Coal slime dryer.
- ECPG (Energy Conversion and Power Generation):** Receives input from the Coal slime dryer and sends material to the RTOs. It emits CO₂.
- Diesel tank:** Provides fuel to the Oxidation system via a Level gauge.
- Legend:**
 - Orange arrow: Electricity flow
 - Green arrow: Gas flow
 - Blue dashed arrow: Baseline scenario
- Project Boundary:** Indicated by a dashed line.

Figure 3 Diagram of the project boundary

The main emission sources and gases included in the project boundary are listed in Table 6 below:

Source		Gas	Included?	Justification/Explanation
Baseline	Methane emissions as a result of venting	CH ₄	Yes	Main emission source. All CMM captured and sent to RTOs would be vented in the baseline scenario.
	Emissions from destruction of methane in the baseline	CO ₂	No	No flaring or energy use in the baseline scenario.
		CH ₄	No	Excluded for simplification.
		N ₂ O	No	Excluded for simplification.
	Electricity generation	CO ₂	No	Excluded. The project activity does not involve replacing electricity from the grid, heat

Source		Gas	Included?	Justification/Explanation
	(electricity provided to the grid and/or to the captive user), heat and vehicle fuel use			generation or vehicle fuel use. No emission reductions will be claimed by such displacement.
		CH ₄	No	Excluded for simplification.
		N ₂ O	No	Excluded for simplification.
Project	Emissions of methane as a result of continued venting	CH ₄	No	The project will take into account only the change in CMM emissions in ex ante estimate of GHG emission reduction; this will be done through rigorous monitoring of the amount of methane utilized or destroyed by the project activity.
	On-site electricity and fuel consumption due to the project activity, including transport of the gas	CO ₂	Yes	Electricity and diesel consumed for the operation of all facilities.
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small.
	On-site electricity and fuel consumption due to the project activity, including transport of the gas	CO ₂	Yes	Electricity and diesel consumed for the operation of all facilities.
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from methane destruction	CO ₂	Yes	Emissions from the oxidation of CMM in RTO in the project activity will be considered.
	Fugitive emissions of	CH ₄	Yes	Un-oxidated methane from RTO will be considered.

Source	Gas	Included?	Justification/Explanation
unburned methane			
Fugitive methane emissions from on-site equipment	CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.

3.4 Baseline Scenario

According to methodology ACM0008, the latest approved version of the “Combined tool to identify the baseline scenario and demonstrate additionality” is applied to identify the baseline scenario.

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The project activity is not the first-of-its-kind.

Step 1: Identification of alternative scenarios

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

Sub-step 1a: Define alternative scenarios to the proposed project activity.

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the project activity. According to ACM0008, one of these alternative(s) shall be the CDM project activity not being registered as a CDM project.

a. Options to handle methane

According to ACM0008 (version 08.0), the baseline scenario alternatives should include all feasible options to handle methane to comply with safety regulations. These alternatives may include, inter alia:

A1: Extraction of methane prior to the mining (CBM/OCM);

A2: Extraction of methane during and after the mining (CMM);

A3: Extraction of methane through ventilation during the mining;

A4: Extraction of methane from the abandoned mine;

A5: Possible combinations of options A1 to A4 with the relative shares of gas specified.

b. Options to deal with methane

The baseline scenario alternatives should include all feasible options to deal with methane. These options could include:

B1 Venting of methane;

B2 Flaring of methane;

B3 Use of methane for energy production, e.g. electricity generation, heat generation, vehicle fuel, gas production, etc.

B4 Possible combinations of options B1 to B3 with the relative shares of gas specified.

Sub-step 1b. Consistency with mandatory applicable laws and regulations:

Any options for CMM management and use that do not meet with local legal or regulatory requirements should be eliminated.

a. Eliminate options to **handle methane**

According to the latest version of National Coalmine Safety Regulation (2016)¹⁷ issued by the State Administration of Work Safety of China and in effect since 01-Oct-2016, the coal mines must be equipped with a complete independent ventilation system to ensure the underground safe production. The Zhujixi coal mine in this project installed 2 pumping system¹⁸ for further safety. Under normal circumstances, the pre-mining extraction and the extraction during mining are carried out through the same set of pumping system, so it is difficult to separate the extraction prior to the mining and the extraction during and after the mining. Therefore, it does not comply with the regulations to carry out pre-mining extraction, during and post-mining extraction separately, and the combination of the two methods must be adopted; the options A1 and A2 are excluded. Regarding Option A3, the methane concentration of the gas extracted through ventilation during the mining must be less than 1% to ensure the safety production, and it cannot be used for energy generation, which means that Option A3 is excluded. And since the coal mines involved in the Project are not abandoned mines, Option A4 is excluded.

In conclusion, option A5 possible combinations of options A1 to A2 is in compliance with legal and regulatory requirements to handle methane. And this is the methane-handling option of the project not implemented as a VCS project.

b. Eliminate options to **deal with methane**

The extracted CMM utilized in the project is low concentration methane, which is below 30%. On 21-January-2010, the Decision on the Revision of Certain Aspects of the <Coalmine Safety

¹⁷ https://www.mem.gov.cn/gk/gwgg/agwzlf/zjl_01/201603/W020190705622814170708.pdf

¹⁸ <https://wenku.baidu.com/view/3207852ba31614791711cc7931b765ce05087a23.html?fr=search-rec-0&wkts=1700639390036&wkQuery=%E6%9C%B1%E9%9B%86%E8%A5%BF%E7%85%A4%E7%9F%BF%E6%8A%BD%E9%87%87>

Regulation¹⁹ was released by the State Administration of Work Safety, stating that CMM with methane concentration of below 30% is forbidden to be combusted directly, but can be either vented or utilized for energy generation.

According to the above regulations, flaring of methane with direct combustion of methane concentration of below 30% is prohibited. Therefore, Option B2 is eliminated.

Regarding option B3 Use of methane for energy production, e.g. electricity generation, heat generation, vehicle fuel, gas production, etc

There are totally six CMM extracting points of the pumping system installed at Zhujixi coalmine. Each of the extracting point is equipped with an independent extracting machine and an independent pipeline, and the concentrations of the extracted CMM are different among the six extracting points. Three out of the six extracting machines supply CMM with a concentration below 8% and around 8% for the project. The other three extract CMM with a concentration higher than 10%, which are used by the electricity generation station out of the project boundary. Only the three extracting points which transport CMM with a concentration below 8% and around 8% are involved in the project boundary. From the current technical application situation, extracted gas with a concentration of 8%-30%²⁰ can be directly used as an internal combustion engine to generate electricity. The extracted lower concentration CMM with a concentration below 8% which is to be used in the project scenario are basically all directly discharged to the air in the absence of the implementation of the project, since its concentration is lower than the required concentration by the generation plant. When methane concentration cannot satisfy the requirement of generators, operating the generators would damage the machines and bring extra repairing expenses. So, electricity generation is not a possible option.

The concentration and flow of CMM in coal mines are unstable. According to “the Urban Gas Specification” (GB50028-93), as urban gas, methane concentration of CMM should reach 36.8%~78.9%. The concentration of CMM used in the project cannot fulfil the requirement to be used as vehicle fuel. It will cause explosion if used in vehicles. Use of methane for vehicle fuel and gas production is excluded. In option B3, there remains the option to use the methane for heat/hot air (thermal energy) generation, which is also the option that the project not implemented as a VCS project.

As option B4 possible combinations of options B1 to B3 with the relative shares of gas specified, according to analyse above, the possible combinations are option B1 venting of methane and option B3 use of methane for heat generation. However, it is contradictory for methane venting and methane use for heat, thus, option B4 is excluded.

In conclusion, options B1 venting of methane and B3 use of methane for heat generation are the applicable scenarios in compliance with legal and regulatory requirements.

¹⁹ https://www.gov.cn/gzdt/2010-03/02/content_1545565.htm

²⁰ https://www.thepaper.cn/newsDetail_forward_22124801

As above, the baseline alternative options that are technically feasible and comply with all legal and regulatory requirements are listed below:

Scenario ID	CMM extraction	CMM treatment
Scenario 1 (A5+B1)	Combinations of options A1 to A2	Venting
Scenario 2 (A5+B3)	Combinations of options A1 to A2	Use of methane for hot air (thermal energy) production

Step 2: Barrier analysis

Not applicable. To summarize, the only baseline scenario alternative that faces no prohibited barriers is:

Scenario 1 (A5+B1): CMM are extracted and vented into the atmosphere without utilisation. So scenario 1 (A5+B1) is identified as the baseline scenario.

Scenario 2 (A5+B3) needs to be further discussed in section 3.5 Step 3: Investment analysis and step 4: Common analysis, and the scenario 2 is identified as the baseline scenario through Step 3 Investment analysis in the section 3.5 below:

Scenario 2 (A5+B3)	Combinations of options A1 to A2	Use of methane for hot air (thermal energy) production
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3.5 Additionality

The project uses the following steps to demonstrate additionality. The project meets the additionality criteria as outlined in the VCS methodology as:

Step 1: Regulatory Surplus: the project is not mandated by any legal requirements. Please refer to section 3.5.1 below for details.

Step 2: CDM tool02 *Combined tool to identify the baseline scenario and demonstrate additionality* is applied to demonstrate that the project is additional. Please refer to section 3.4 and 3.5.2 of this report for details.

3.5.1 Regulatory Surplus

Is the project registered or seeking registration in an UNFCCC Annex 1 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

As demonstrated in section 1.15 of this report, the project complies with all applicable laws and regulations, and is not mandated by any laws, statute, or other regulatory framework of China, therefore fulfils the requirements of regulatory surplus of VCS program.

3.5.2 Additionality Methods

Scenario 2 alternative combination A5+B3 is the situation of project scenario, which can be described as: Extracting methane prior to the mining (CBM/OCM) or methane during and after the mining (CMM) for hot air production and the project activity not undertaken as a VCS project activity. The project scenario isn't financially attractive, as demonstrated by following steps by using the Tool01 for the Demonstration and Assessment of Additionality (Version 07.0.0) approved by the CDM EB and VCS. Meanwhile, alternative combination A5+B1 is to maintain the present situation and faces no financial barrier. As a supplementary statement for selecting baseline scenarios, alternative combination A5+B1 can be determined as baseline scenario here.

Step 3²¹: Investment Analysis

Sub-step 3a: Determine appropriate analysis method

Tool for the Demonstration and Assessment of Additionality (Version 07.0.0) recommends three analysis methods including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The project may generate economic benefits through charging for drying coal slimes as well as CDM/VCS revenues, therefore simple cost analysis (Option I) is not appropriate. Since the baseline scenario is the business-as-usual scenario rather than an investment project, an investment comparison is not suitable either. To conclude, benchmark analysis method (Option III) has been selected as a proper approach. Benchmark analysis (Option III) is applied for the project.

Sub-step 3b: Option III. Apply benchmark analysis

Physical processing of coal products belongs to coal industry, of which the benchmark IRR is 12% (project IRR, before tax) according to Fagaitouzi[2006]No.1325 ²² published by National Development and Reform Commission. If the project has a project IRR less than the benchmark of 12% (before tax), then the project cannot be considered as financially attractive.

Sub-step 3c: Calculation and comparison of the financial indicator

Based on the Feasibility Study Report (FSR) dated 17-December-2020, the main assumptions for the investment analysis are shown in Table 3, all the parameters are valid by the time of project investment decision on 29-December-2020, which is also the date of project approval by local

²¹ Here, step 2 of Tool01 is used for investment analysis.

²² https://www.mohurd.gov.cn/gongkai/zhengce/zhengcefilelib/200607/20060725_156804.html

government agency Huainan City Panji district Development and Reform Commission. The FSR was completed by Xi'an Xujing Renewable Resources Co., Ltd that holds the engineering design certification of new energy power generation in power industry and thermal engineering approved by Shaanxi Provincial Department of Housing and Urban-Rural Development.

Table 3 Main parameters for investment analysis and evaluation

	Main parameter	Unit	Value
1	Total static investment	CNY	85,922,000
2	Working capital	CNY	2,196,000
3	Operation Period	Year	10
4	Annual coal slime output	t/year	336,000
5	Coal slime drying tariff (including VAT)	CNY/t	90
6	Value added tax rate (VAT)	%	13% ²³
7	City maintenance & construction tax rate	%	5% ²⁴
8	Educational surcharges rate	%	5% ²⁵
9	Depreciation Period	Years	10
10	Scrap value of fixed assets	%	3%
11	Breakdown of annual operation and management cost	-	-
	-Employee	Number	20
	-Salary	CNY/person	80,000
	-Welfare rate (of salary)	%	59%
	Energy cost	CNY/year	7,862,000
	-Electricity tariff	CNY/year	7,862,000
	Insurance rate	%	0.3%
	Repair rate	%	5%

²³ <https://zhuanlan.zhihu.com/p/115197259>

²⁴ <https://zhuanlan.zhihu.com/p/429044454>

²⁵ <https://zhuanlan.zhihu.com/p/429044454>

	Other cost	CNY	2,000,000
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The project IRR (before tax) of the project is shown in following table:

Project IRR	Benchmark project IRR
4.17%	12%

The conclusion drawn from the investment analysis is that Scenario 2, i.e., the Project without revenue from carbon credits, would not be financially attractive.

A sensitivity analysis is conducted to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions, i.e., whether the project IRR without revenue from carbon credits would remain below the benchmark value. As per TOOL27 (version 12.0), variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. Among the parameters listed in *Table 3*, the total static investment is the main project cost during the project construction; during the project operation, the majority of project costs are O&M cost. Regarding project revenues, the service tariff from drying wet coal slime constitutes the major part; since the service tariff are directly influenced by the coal slime output, this parameter should hence be subjected to variation.

In summary, the variables which are subjected to variation include:

- Total static investment
- Annual coal slime output
- Annual O&M cost
- Coal slime drying tariff (including VAT)

The IRR values with variations in these financial parameters are shown in *Table 4*.

Table 4 Sensitivity analysis of Project IRR to variations in financial parameters

	-10%	-5%	0	+5%	+10%	Critical variation
Total static investment	7.19%	5.62%	4.17%	2.81%	1.53%	-23.16%
Annual coal slime output	-1.27%	1.54%	4.17%	6.66%	9.04%	16.48%
Annual O&M cost	7.17%	5.69%	4.17%	2.58%	0.94%	-27.37%
Coal slime drying tariff (including VAT)	-1.27%	1.54%	4.17%	6.66%	9.04%	16.48%

As shown table above, even when the total static investment and O & M Costs fluctuate within the range of -10%~10%, the project IRR (before tax) of the project remains less than 12%. The project is financially unattractive even under wide market variation.

Total static investment

According to data from the National Bureau of Statistics²⁶, the indices of fixed asset investment price were 102.6, 105.4, 105.8, 99.4 and 98.2 (the value of the previous year taken as 100) for the five years from 2015 to 2019, indicating an overall increasing investment cost. Besides, the investment of the Project has reached the initially estimated static investment. Therefore, the total static investment of the Project is unlikely to decrease by 23.16%.

Annual coal slime output

Anhui Province plans to implement “Electric power green low-carbon transformation” and importing excessive power outside the province before 2025²⁷. As a result, wet coal lime produced amount might decrease with the decreasing demanded quantity of coals. In fact, the coal slime produced in 2022 from the project was 105,960 tonnes, only 31.5% of estimation. It is almost impossible that the annual coal slime output increases by 16.48%.

Annual O&M cost

Annual O & M cost mainly involves staff salary *and electricity consumption*. The electricity price is decided by the contract between the PO and the coal mine and since is stable. As for staff salary, it can be seen from CPI (consumer price index)²⁸ that the prices of labour wages and materials costs are rising. So, the Annual O & M cost is not likely to decrease.

Coal slime drying tariff (including VAT)

The coal slime drying tariff (including VAT) is decided by the contract between the PO and the coal mine and since is stable, unlikely to increase.

Since all the data used for the investment analysis was sourced from the FSR, which was completed by qualified third party approved by authorized official. And considering the condition since the project put into operation, the data used in the investment analysis are believed to be reliable and credible and none of above conditions can be achieved.

In conclusion, the project IRR (before tax) will not reach the benchmark of 12% within reasonable fluctuation range, and the fluctuation scenario of the uncertain factors which could make the Project financially feasible is unlikely to occur. Therefore, the conclusion regarding the feasibility of the project is robust to reasonable variations of the critical assumptions.

²⁶ <https://data.stats.gov.cn/easyquery.htm?cn=C01>

²⁷ <https://www.ah.gov.cn/group6/M00/06/CE/wKg8BmOGufWAI9Z1AAU66WkdAcs654.pdf>

²⁸ <http://finance.people.com.cn/n1/2022/0112/c1004-32329576.html>

Step 4. Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the proposed Project Activity

According to the Tool24 Common Practice (version 3.1), other activities similar to the proposed project activity are analysed as follows:

- **Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.**

The project is a CMM utilization project with a designed gas treatment capacity of 10,368,000 m³ of CH₄ per year, and $\pm 50\%$ of the capacity is thus from 5,184,000 m³/y to 15,552,000 m³/y.

Sub-step 4-2: Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

- **Identify similar projects (both CDM and non-CDM) which fulfil all the following conditions:**

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

As the technology development, geological and transportation conditions and economic development level vary a lot from one province to another, only projects located in Anhui Province are considered.

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

Only projects which applies flameless oxidation using CMM are considered.

(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;

Only projects which use CMM are considered.

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

Only projects which generate hot air to dry wet coal slime are considered.

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

Only projects with a gas treatment capacity between 5,184,000 m³/y to 15,552,000 m³/y are considered.

(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.

Under the CDM program, the start date is defined as the date on which the project participants commit to making expenditures for the construction or modification of the main equipment or

facility, or for the provision or modification of a service; where a contract is signed for such expenditures, it is the date on which the contract is signed; if the project involves more than one of such contracts or incurred expenditures, it is the first of the respective dates. Regarding the Project, the first major contract signed was the Construction Contract of Regenerative Thermal Oxidizer, signed on 30-May-2021; this date is hence considered as the start date. Therefore, only projects which started commercial operation before 30-May-2021 are considered.

To sum up, similar projects should be located in Anhui Province, able to utilize 5,184,000 m³ to 15,552,000 m³ of CMM per year, and started commercial operation before 30-May-2021.

There is no similar project under CDM, VCS, GS and any GHG reduction programme or mechanism.

- **Within the projects identified in Step 2, identify those that are neither registered GHG project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all} .**

Because the number of identified projects is 0, $N_{all}=0$.

- **Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their Number N_{diff} .**

Since $N_{all}=0$, $N_{diff}=0$.

- **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.**

The factor for the project activity is calculated as follows:

In terms of the formula: $F=1-N_{diff}/N_{all}$, the result is mathematically meaningless.

$$N_{all} - N_{diff} = 0$$

Thus, the project does not fulfil the requirement that F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3, and the project is not a common practice in Anhui Province.

3.6 Methodology Deviations

Not applicable.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

Since put into production in commission from 14-December-2021, the project keeps in good running. All the production instruments and monitoring equipment are well operated. Staff are

working normally and safely. Implementations of the project applies with the national law. No other changes (e.g., to project proponent or other entities) occur. Monitoring plan of the project (please refer to section 6.3) is carried out as expectations.

5 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions are determined in two steps:

Step A. Determination of methane eligible for crediting

For the project, all captured CMM is eligible for crediting.

Step B. Determination of baseline emissions.

Baseline emissions would have occurred due to methane destruction, methane venting and use of other fossil fuels that are displaced by methane under the project activity. Baseline emissions due to venting should be discounted in case host country has regulations in place that are restricting the release of methane into the atmosphere.

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{use,y} \quad (1)$$

Where:

BE_y	=	Baseline emissions in year y (tCO ₂ e)
$BE_{MD,y}$	=	Baseline emissions from destruction of methane in the baseline scenario in year y (tCO ₂ e);
$BE_{MR,y}$	=	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
$BE_{use,y}$	=	Baseline emissions from the production of power, heat or other forms of useful energy replaced by the project activity in year y (tCO ₂ e)

Methane destruction in the baseline scenario

The baseline scenario does not involve any flaring or usage of CMM, therefore, there is no methane destruction in the baseline. So, destruction of methane in the baseline scenario ($BE_{MD,y}$) is 0.

Methane venting in the baseline scenario

The amount of methane that would have been emitted to the atmosphere in the baseline scenario shall be determined as follows:

$$BE_{MR,y} = \sum_i \sum_s (MT_{PJ,s,i,y} - MT_{BL,s,i,y}) \times GWP_{CH4} \quad (2)$$

Where:

$BE_{MR,y}$	=	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
$MT_{PJ,s,i,y}$	=	Methane from source s captured and destroyed by use i in the project activity in year y (t CH ₄);
$MT_{BL,s,i,y}$	=	Methane from source s that would have been captured and destroyed by use i in the baseline scenario in the year y (t CH ₄) ;
i	=	Use of methane (flaring, power generation, etc.)
s	=	Source of methane that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y. This may include eligible CBM, CMM, VAM, eligible AMM and eligible OCM
GWP_{CH4}	=	Global warming potential of methane (t CO ₂ e/t CH ₄)

In the baseline scenario, there is no CMM captured and destroyed, and the use of methane only involves hot air production, thus $MT_{BL,s,i,y}$ is 0;

Thus,

$$BE_{MR,y} = MT_{PJ,s,i,y} \times GWP_{CH4} \quad (3)$$

Methane from the mine captured and destroyed by the project ($MT_{PJ,s,i,y}$) equals to methane measured sent to use (MM_{i,y}, will be described in section 5.2). So the calculation of parameter $MT_{PJ,s,i,y}$ is the same as MM_{i,y}

Production of power, heat or other forms of useful energy replaced by the project activity in baseline scenario

The project used extracted CMM for hot air (thermal energy) generation. However, the generated hot air can't be monitored. Thus, for the conservative, the emission reduction generated by hot air replacement is not claimed. So $BE_{Use,y}=0$

To conclude, the baseline emissions is calculated by the following equation:

$$BE_y = BE_{MR,y} \quad (4).$$

5.2 Project Emissions

Project emissions comprise the following sources:

- (a) Emissions from the energy use to capture and use methane;
- (b) Emissions from destruction of captured methane through production of various energy types and/or flaring and/or flameless oxidation;
- (c) Emissions from the un-combusted methane.

Project emissions are defined by the following equation:

$$PE_y = PE_{ME,y} + PE_{MD,y} + PE_{UM,y} \quad (5)$$

Where:

PE_y	=	Project emissions in year y (tCO ₂ e)
$PE_{ME,y}$	=	Project emissions from energy use to capture and use methane (tCO ₂ e)
$PE_{MD,y}$	=	Project emissions from destruction of captured methane (tCO ₂ e)
$PE_{UM,y}$	=	Project emissions from un-combusted methane in year y (tCO ₂ e)

Project emissions from the energy use to capture and to use methane

During the normal operation of the project activity, the additional electricity consumption required by the project activity to oxidate the methane gas flow and coal slime dryer. For the first time igniting the RTOs, diesel is consumed.

According to methodology ACM0008 (v08.0), emissions due to electricity consumption should be determined using the latest version of the “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (v03.0) should be used. Fossil fuel consumption should apply “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (version 03.0).

$$\text{Thus, } PE_{ME,y} = PE_{EC,y} + PE_{FC,j,y} \quad (6)$$

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y}) \quad (7)$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO ₂ /yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EF,j,y}$	Emission factor for electricity generation for source j in year y (tCO ₂ /MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

j Sources of electricity consumption in the project

For the project, Option A2 of Tool05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) is chosen. A value of 1.3 t CO₂/MWh for $EF_{EF,j,y}$ is used to calculate project emissions because the project only involves electricity consumption from the national grid so it accords with (i) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources.

According to the tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0), i) 20% is used for “project or leakage electricity consumption sources”. Thus, use as default values of 20% for project and leakage electricity consumption sources for the project, i.e. $TDL_{j,y} = 20\%$.

CO₂ emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (8)$$

Where:

- $PE_{FC,j,y}$ = Are the CO₂ emissions from fossil fuel combustion in process j during the year y (tCO₂/yr)
- $FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
- $COEF_{i,y}$ = Is the CO₂ emission coefficient of fuel type i in year y (tCO₂/mass or volume unit)
- i = Are the fuel types combusted in process j during the year y

The CO₂ emission coefficient $COEF_{i,y}$ is calculated using Option B: The CO₂ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO₂ emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (9)$$

Where:

- $COEF_{i,y}$ = Is the CO₂ emission coefficient of fuel type i (tCO₂/mass or volume unit)
- $NCV_{i,y}$ = Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel)
- $EF_{CO2,i,y}$ = Is the weighted average CO₂ emission factor of fuel type i in year y (tCO₂/GJ)

i = Are the fuel types combusted in process j during the year y

The NCV value 43.3 TJ/Gg and $EF_{CO_2,i,y}$ 74800 kg/TJ are extracted from vol. 2 of 2019 Refinement to 2006 IPCC Guidelines. So, $COEF_{i,y} = 3.19 \text{ tCO}_2/\text{t} = 74800 \text{ kg/TJ} \times 43.3 \text{ TJ/Gg} / 1000000$

Project emissions from destruction of captured methane

When the captured methane is burned in a flare, heat or power plant, or oxidized in a flameless oxidation unit, combustion emissions are released.

$$PE_{MD,y} = \sum_i MD_{i,y} \times CEF_{CH_4} \quad (10)$$

Where:

$PE_{MD,y}$ = Project emissions from methane destroyed (tCO₂e)

$MD_{i,y}$ = Methane destroyed through use i (tCH₄)

i = Use of methane (power generation, heat generation, supply to gas grid to various combustion end uses)

CEF_{CH_4} = Carbon emission factor for combusted methane. Set as 2.75 (t CO₂/t CH₄)

The Project only involve in methane destroyed through hot air generation.

Thus, $PE_{MD,y} = MD_{i,y} \times CEF_{CH_4}$

In each end-use, the amount of methane destroyed depends on the efficiency of oxidation of each end use and should be determined as follows.

$$MD_{i,y} = MM_{i,y} \times Eff_{i,y} \quad (11)$$

Where:

$MD_{i,y}$ = Methane destroyed through use i in year y (t CH₄)

$MM_{i,y}$ = Methane measured sent to use i in year y (tCH₄)

$Eff_{i,y}$ = Efficiency of methane destruction in use i in year y (%), equals to the parameter $EFF_{OX,y}$

For the parameter $MM_{i,y}$

As the gaseous flow is measured by flow meter with volume unit, density of the methane shall be determined in order to calculate the methane. The methane density is determined as per Tool08 “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0). For the project, the flow of gaseous stream is volume flow-wet basis, and the volumetric fraction is wet basis, thus, Option C is applied to determine the methane density as follow:

$$\rho_{i,n} = \frac{P_n \times MM_i}{R_u \times T_n} \quad (12)$$

Where:

$\rho_{i,n}$ = Density of greenhouse gas i in the gaseous stream at normal conditions (kg gas i/m³ wet gas i)

P_n = Absolute pressure at normal conditions (Pa)

T_n = Temperature at normal conditions (K)

MM_i = Molecular mass of greenhouse gas i (kg/kmol)

R_u = Universal ideal gases constant (Pa.m³ /kmol.K)

The following requirements apply:

- a) CH₄ is the greenhouse gas for which the mass flow will be determined;
- b) The mass flow will be calculated on an hourly basis for each hour h in year y;
- c) The mass flow calculated for hour h is 0 if the equipment is not working in hour h (Opj,h=not working), the hourly values are then summed to a yearly unit basis.

For the parameter $EFF_{i,y}$ ($EFF_{ox,y}$)

The project applies flameless oxidation process to treat CMM, so the efficiency of flameless oxidation process is determined as follows:

$$Eff_{ox,y} = 1 - \frac{PC_{CH_4,exhaust,y} \times D_{CH_4,correxh,y}}{PC_{CH_4,VAM,y} \times D_{CH_4,corrinflow,y}} \quad (13)$$

Where:

$EFF_{ox,y}$ = Efficiency of the flameless oxidation process in year y (%)

$PC_{CH_4,exhaust,y}$ = Annual average concentration of methane in the gas flow exiting the flameless oxidation unit in year y (m³/m³)

$D_{CH_4,correxh,y}$ = Annual average density of methane corrected for pressure and temperature in the exhaust gases corrected to reference conditions (t CH₄/m³)

$PC_{CH_4,VAM,y}$ = Annual average concentration of methane in the gas flow entering the flameless oxidation unit (m³/m³)

$D_{CH_4,corrinflow,y}$ = Annual average density of methane entering the flameless oxidation unit corrected to reference conditions (t CH₄/m³)

Project emissions from un-combusted methane

Not all of the methane sent to the flare, to the flameless oxidizer or used to generate power and heat will be combusted, so a small amount will be released to the atmosphere. These emissions are calculated as follows:

$$PE_{UM,y} = GWP_{CH_4} \times \sum_i MM_{i,y} \times (1 - Eff_{i,y}) \quad (14)$$

Where:

$PE_{UM,y}$ = Project emissions from un-oxidated methane (tCO₂e)

GWP_{CH_4} = Global warming potential of methane (t CO₂e/t CH₄)

i = Use of methane (power generation, heat generation, supply to gas grid to various combustion end uses)

$MM_{i,y}$ = Methane measured sent to use i in year y (t CH₄), i is only for electricity, so $MM_{i,y}$

$Eff_{i,y}$ = Efficiency of methane destruction in use i in year y (%), equals to $EFF_{ox,y}$

For ex ante projections, the efficiency of destruction of methane in the flameless oxidation process may be assumed to be 90 per cent. For subsequent monitoring, please refer to section 6.

5.3 Leakage Emissions

Leakage may occur if the project activity prevents methane from being used to meet baseline thermal energy demand, whether as a result of physical constraints on delivery, or price changes.

Since the baseline scenario of the project does not include thermal energy use, the leakage (LE_y) is taken as zero.

5.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

According to formula (12), density of methane under 273.15K (temperature) and 101,325pa (pressure) $\rho_{i,n} = \frac{P_n \times MM_i}{R_u \times T_n} = (101,325\text{Pa} \times 16.04\text{kg kmol}^{-1}) / (8314\text{Pa. m}^3/\text{kmol. K} \times 273.15\text{K}) = 0.00071566 \text{ t CH}_4/\text{m}^3$.

The estimated annual CMM measured sent to RTO will be 10.368 million Nm³ CMM per year when the project is fully operated. The volume of CMM utilized by the project is estimated under the temperature of 273.15K and 101,325pa. So the methane measured sent to destruct annually is calculated as follows:

$$MT_{PJ,s,i,y} = MM_{i,y} = 10.368 \times 10^6 \text{ m}^3 \times 0.00071566 \text{ t/m}^3 = 7,419.963 \text{ tCH}_4$$

1. Calculation of the baseline emissions

According to formula (3) and (4), the baseline emissions from release of methane into the atmosphere is: $BE_{MR,y} = GWP_{CH_4} \times MT_{PJ,s,i,y} = 28 \text{ tCO}_2/\text{tCH}_4 \times 7,419.963 \text{ tCH}_4 = 207,758 \text{ tCO}_2\text{e}$

Baseline emissions are:

$$BE_y = BE_{MR,y} = 207,758 \text{ tCO}_2\text{e}$$

2. Calculation of the project emissions

2.1 Project emissions from the energy use to capture and to use methane are calculated with formula (6)(7)(8)(9):

$$PE_{ME,y} = PE_{EC,y} + PE_{fc,j,y} = FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,y} + EC_{PJ,y} \times EF_{i,y} \times (1 + TDL_i) = 2.08t \times 43.3TJ/Gg \times 74800kg/TJ / 1000000 + 11,232MWh \times 1.3 MWh/tCO_2e \times (1 + 20\%) = 17,529 tCO_2e$$

2.2 Project emissions from destruction of captured methane are calculated with formula (9), (10) and (11):

$$PE_{MD,y} = MD_{i,y} \times CEF_{CH4} = MM_{i,y} \times Eff_{OX,y} \times CEF_{CH4} = 7,419.963 tCH_4 \times 90\% \times 2.75tCO_2/tCH_4 = 18,365 tCO_2e$$

2.3 Project emissions from un-combusted methane are calculated with formula (12)

$$PE_{UM,y} = GWP_{CH4} \times MM_{i,y} \times (1 - Eff_{OX,y}) = 28 tCO_2/tCH_4 \times 7,419.963 tCH_4 \times (1 - 90\%) = 20,776 tCO_2e$$

Project emissions are calculated by formula (5), as follows:

$$PE_y = PE_{ME,y} + PE_{MD,y} + PE_{UM,y} = 17,522 tCO_2e + 18,365 tCO_2e + 20,776 tCO_2e = 56,670 tCO_2e$$

3. Calculation of the leakage

As described in section 4.3, $LE_y = 0$.

4. Calculation of emission reductions

The emission reductions can be obtained from the equation below:

$$ER_y = BE_y - PE_y - LE_y = 207,758 tCO_2e - 56,670 tCO_2e - 0 tCO_2e = 151,088 tCO_2e$$

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-December - 2021 to 31-December-2021	10,246 ²⁹	2,795 ³⁰	0	7,451	0	7,451
01- January -2022 to 31-December-2022	207,758	56,670	0	151,088	0	151,088
01- January -2023 to 31-	207,758	56,670	0	151,088	0	151,088

²⁹ It is covering 18 days from 14-December-2021 to 31-December-2021. So the estimated baseline emission during this period is 10,246 tCO_{2e} = 207,758 tCO_{2e} * 18 days/365days.

³⁰ It is covering 18 days from 14-December-2021 to 31-December-2021. So the estimated project emission during this period is 2,795 tCO_{2e} = 56,670 tCO_{2e} * 18 days/365days.

December-2023						
01- January -2024 to 31-December-2024	207,758	56,670	0	151,088	0	151,088
01- January -2025 to 31-December-2025	207,758	56,670	0	151,088	0	151,088
01- January -2026 to 31-December-2026	207,758	56,670	0	151,088	0	151,088
01- January -2027 to 31-December-2027	207,758	56,670	0	151,088	0	151,088
01- January -2028 to 31-December-2028	207,758	56,670	0	151,088	0	151,088
01- January -2029 to 31-December-2029	207,758	56,670	0	151,088	0	151,088
01- January -2030 to 31-December-2030	207,758	56,670	0	151,088	0	151,088
01- January -2031 to 13-	197,512 ³¹	53,869 ³²	0	143,637	0	143,637

³¹ It is covering 347 days from 01-January-2031 to 13-December-2031. So the estimated baseline emission during this period is 197,512 tCO₂e = 207,758 tCO₂e * 347 days/365days.

³² It is covering 347 days from 01-January-2031 to 13-December-2031. So the estimated project emission during this period is 53,869 tCO₂e = 56,670 tCO₂e * 347 days/365days.

December-2031						
Total	2,077,580	566,700	0	1,510,880	0	1,510,880

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	CEF _{CH4}
Data unit	tCO ₂ e/ tCH ₄
Description	Carbon emission factor for combusted methane
Source of data	ACM0008 (Version 08.0)
Value applied:	2.75
Justification of choice of data or description of measurement methods and procedures applied	ACM0008 (Version 08.0) default value
Purpose of Data	Calculation of project emissions
Comments	44/16 = 2.75tCO ₂ e/tCH ₄

Data / Parameter	EF _{EF, j,y}
Data unit	tCO ₂ e/ MWh
Description	Default value of the emission factor
Source of data	Tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	Project emissions of the project only involves electricity consumption from the national grid, so a value of 1.3 t CO ₂ /MWh is chosen as the project accords with (i), (a), Option A2.

Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	TDL _{j,y}
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (v03.0)
Value applied	20%
Justification of choice of data or description of measurement methods and procedures applied	According to the tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0), i) Use as default values of 20% for “project or leakage electricity consumption sources” Thus, Use as default values of 20%.
Purpose of Data	Calculation of project emissions
Comments	The parameter will be updated according to the tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0).

Data / Parameter	R _u
Data unit	Pa.m ³ /kmol.K
Description	Universal ideal gases constant
Source of data	Tool08 “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)
Value applied	8,314
Justification of choice of data or description of measurement methods and procedures applied	-

Purpose of Data	Calculation of parameter $\rho_{i,n}$, which is used to calculate the methane captured and destroyed by the project activity in mass unit
Comments	-

Data / Parameter	MMi
Data unit	kg/kmol
Description	Molecular mass of greenhouse gas CH ₄
Source of data	Tool08 "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value applied	16.04
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of parameter $\rho_{i,n}$, which is used to calculate the methane captured and destroyed by the project activity in mass unit
Comments	-

Data / Parameter	P _n
Data unit	pa
Description	Total pressure at normal conditions
Source of data	Tool08 "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value applied	101,325 Pa
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of parameter $\rho_{i,n}$, which is used to calculate the methane captured and destroyed by the project activity in mass unit

Comments	-
Data / Parameter	T_n
Data unit	K
Description	Temperature at normal conditions
Source of data	Tool08 “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)
Value applied	273.15
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of parameter $\rho_{i,n}$, which is used to calculate the methane captured and destroyed by the project activity in mass unit
Comments	-

Data / Parameter	$\rho_{i,n}$
Data unit	Kg gas i/m ³ gas i
Description	Density of methane under the condition of 273.15 K (temperature) and 101,325 pa (pressure)
Source of data	Tool08 “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)
Value applied	0.71566
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Used to calculate the methane captured and destroyed by the project activity in mass unit. For $MT_{PJ,s,i,y}$ and $MM_{i,y}$ is monitored by flow meter in volume unit, which will be converted to mass unit.

Comments	Applicable to Option C, $\rho_{i,n}=101,325\text{Pa}$ × $16.04\text{kg/kmol} \div (8314\text{Pa} \cdot \text{m}^3/\text{kmol} \cdot \text{K} \times 273.15\text{K}) = 0.71566 \text{ kg}$ gas i/m ³ gas i
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6.2 Data and Parameters Monitored

Data / Parameter	MT _{PJ,s,i,y}
Data unit	tCH ₄
Description	Methane from source s captured and destroyed by use i in the project activity in year y
Source of data	Calculated using the monitored data
Description of measurement methods and procedures to be applied	MT _{PJ,s,i,y} is calculated by multiplying methane volume (measured by flow meters) and methane density $\rho_{i,n}$. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuously recorded and gathered per month
Value applied	7,419.963 (Ex ante)
Monitoring equipment	Flow meters and gas analyzers
QA/QC procedures to be applied	Flow meters and gas analyzers are annually checked and calibrated.
Purpose of data	Calculation of baseline emissions
Calculation method	For MT _{PJ,s,i,y} is monitored by flow meters and gas analyzers in volume unit, which will be converted to mass unit with the parameter of $\rho_{i,n}$.

Comments	There are three flow meters and three gas analyzers used for monitoring the methane volume extracted from the Zhujixi coal mine. The computer can automatically translate the data under working conditions to standard condition 273.15 K (temperature) and 101,325 pa (pressure). Flow meters' information are as below:			
	Monitoring equipment	Flowmeter (F1)	Flowmeter (F2)	Flowmeter (F3)
	Type	GD3(A)	GD3(A)	GD3(A)
	Serial No.	289000138	289000139	289000140
	Accuracy	±1.5%	±1.5%	±1.5%
	Monitoring equipment	Gas analyzer (C6)	Gas analyzer (C7)	Gas analyzer (C8)
	Type	GJG100J	GJG100J	GJG100J
	Serial No.	2115096	2115281	2115285
	Accuracy	±5%	±5%	±5%

Data / Parameter	MM _{i,y}
Data unit	tCH ₄
Description	Methane measured sent for heat generation in year y
Source of data	Calculated from the monitored data
Description of measurement methods and procedures to be applied	MM _{i,y} (same as MT _{PJ,s,i,y}) is calculated by multiplying methane volume (measured by flow meters and methane density ρ _{i,n}). All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuously recorded and gathered per month
Value applied	7,419.963 (Ex ante)
Monitoring equipment	Flow meters and gas analyzers
QA/QC procedures to be applied	Flow meters and gas analyzers are annually checked and calibrated.
Purpose of data	Calculation of project emissions

Calculation method	For $MM_{i,y}$ (volume) is monitored by flow meters and gas analyzers in volume unit, which will be converted to mass unit with the parameter of $\rho_{i,n}$.																																
Comments	There are three flow meters used for monitoring the methane volume extracted from the Zhujixi coal mine. The computer can automatically translate the data under working conditions to standard condition 273.15 K (temperature) and 101,325 pa (pressure). Flow meters' information are as below: <table><tr><td>Monitoring equipment</td><td>Flowmeter (F1)</td><td>Flowmeter (F2)</td><td>Flowmeter (F3)</td></tr><tr><td>Type</td><td>GD3(A)</td><td>GD3(A)</td><td>GD3(A)</td></tr><tr><td>Serial No.</td><td>289000138</td><td>289000139</td><td>289000140</td></tr><tr><td>Accuracy</td><td>$\pm 1.5\%$</td><td>$\pm 1.5\%$</td><td>$\pm 1.5\%$</td></tr></table> <table><tr><td>Monitoring equipment</td><td>Gas analyzer (C6)</td><td>Gas analyzer (C7)</td><td>Gas analyzer (C8)</td></tr><tr><td>Type</td><td>GJG100J</td><td>GJG100J</td><td>GJG100J</td></tr><tr><td>Serial No.</td><td>2115096</td><td>2115281</td><td>2115285</td></tr><tr><td>Accuracy</td><td>$\pm 5\%$</td><td>$\pm 5\%$</td><td>$\pm 5\%$</td></tr></table>	Monitoring equipment	Flowmeter (F1)	Flowmeter (F2)	Flowmeter (F3)	Type	GD3(A)	GD3(A)	GD3(A)	Serial No.	289000138	289000139	289000140	Accuracy	$\pm 1.5\%$	$\pm 1.5\%$	$\pm 1.5\%$	Monitoring equipment	Gas analyzer (C6)	Gas analyzer (C7)	Gas analyzer (C8)	Type	GJG100J	GJG100J	GJG100J	Serial No.	2115096	2115281	2115285	Accuracy	$\pm 5\%$	$\pm 5\%$	$\pm 5\%$
Monitoring equipment	Flowmeter (F1)	Flowmeter (F2)	Flowmeter (F3)																														
Type	GD3(A)	GD3(A)	GD3(A)																														
Serial No.	289000138	289000139	289000140																														
Accuracy	$\pm 1.5\%$	$\pm 1.5\%$	$\pm 1.5\%$																														
Monitoring equipment	Gas analyzer (C6)	Gas analyzer (C7)	Gas analyzer (C8)																														
Type	GJG100J	GJG100J	GJG100J																														
Serial No.	2115096	2115281	2115285																														
Accuracy	$\pm 5\%$	$\pm 5\%$	$\pm 5\%$																														

Data / Parameter	GWP_{CH_4}
Data unit	tCO _{2e} / tCH ₄
Description	Global warming potential of methane
Source of data	IPCC Fifth Assessment Report (AR5)
Description of measurement methods and procedures to be applied	IPCC Fifth Assessment Report (AR5) default value
Frequency of monitoring/recording	The parameter will be updated according to the relevant documents
Value applied	28
Monitoring equipment	-
QA/QC procedures to be applied	-

Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	-
Comments	-

Data / Parameter	EC _{PJ,j,y}		
Data unit	MWh		
Description	Quantity of electricity consumed by the project electricity consumption source j in year y		
Source of data	Monitoring data provided by the project owner		
Description of measurement methods and procedures to be applied	Electricity consumed by the project is daily measured by an electricity meter installed on-site. PO regularly recorded the electricity consumption and settled with the power company every month. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
Frequency of monitoring/recording	Continuously monitored and monthly aggregated		
Value applied	11,232 (ex ante)		
Monitoring equipment	The electricity meter		
QA/QC procedures to be applied	The data will be confirmed by recordings from POs. The electricity meter will be periodically checked and maintained. Calibration will be carried out once a year to ensure normal operation.		
Purpose of data	Calculation of project emissions.		
Calculation method	-		
Comments	The electricity meters are monthly recorded and confirmed. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
	Monitoring equipment	Electricity meter (main meter)	Electricity meter (back-up meter)
	Type	DSSD25	DTZ341
	Serial No.	0801756	2009513972000066
	Accuracy	0.5S	0.2S

Data / Parameter	EFF _{i,y} (Eff _{ox,y})
Data unit	-
Description	Efficiency of methane destruction in use i
Source of data	Calculated using recording documents from PP
Description of measurement methods and procedures to be applied	The parameter is calculated with the formula: $Eff_{ox,y} = 1 - \frac{PC_{CH_4,exhaust,y} \times D_{CH_4,correxh,y}}{PC_{CH_4,VAM,y} \times D_{CH_4,corrinflow,y}}$ PC_{CH₄,exhaust,y} and PC_{CH₄,VAM,y} represent “annual average concentration of methane in the flameless oxidation exiting the flameless oxidation unit in year y” and “annual average concentration of methane in the gas flow entering the flameless oxidation unit” respectively. The two variations are measured by concentration meters on-site, daily collected and monthly aggregated. D_{CH₄,correxh,y} and D_{CH₄,corrinflow,y} represent “annual average density of methane corrected for pressure and temperature in the exhaust gases corrected to reference conditions” and “annual average density of methane entering the flameless oxidation unit corrected to reference conditions” respectively. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Daily collected and monthly aggregated
Value applied	90% (ex-ante)
Monitoring equipment	Concentration meters
QA/QC procedures to be applied	The calculation value of Eff _{ox,y} and 90% (ex-ant value) will be compared and the minimum value will be taken
Purpose of data	Calculation of project emissions
Calculation method	$Eff_{ox,y} = 1 - \frac{PC_{CH_4,exhaust,y} \times D_{CH_4,correxh,y}}{PC_{CH_4,VAM,y} \times D_{CH_4,corrinflow,y}}$
Comments	-

Data / Parameter	PC _{CH₄,exhaust,y}
Data unit	Mol/L

Description	Annual average concentration of methane in the flameless oxidation exiting the flameless oxidation unit in year y								
Source of data	Monitoring data provided by the project owner								
Description of measurement methods and procedures applied	The concentration of outflow is daily measured by a portable gas analyzer. PO regularly records the concentration. All electronic data and paper documents will be archived for two years following the end of the crediting period.								
Frequency of monitoring/recording	Once per day								
Value applied:	Not applicable ex-ante								
Monitoring equipment	Portable gas analyzer								
QA/QC procedures applied	The gas analyzer will be periodically checked and maintained. Calibration will be carried out once a year to ensure normal operation.								
Purpose of data	Calculation of project emissions								
Calculation method	-								
Comments	The gas analyzer is recorded every day and gathered at least once a week. And it is calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period. <table border="1"> <tr> <td>Monitoring equipment</td><td>Gas analyzer (C5)</td></tr> <tr> <td>Type</td><td>CGM10</td></tr> <tr> <td>Serial No.</td><td>SS238158</td></tr> <tr> <td>Accuracy</td><td>1%</td></tr> </table>	Monitoring equipment	Gas analyzer (C5)	Type	CGM10	Serial No.	SS238158	Accuracy	1%
Monitoring equipment	Gas analyzer (C5)								
Type	CGM10								
Serial No.	SS238158								
Accuracy	1%								

Data / Parameter	PC _{CH4,VAM,y}
Data unit	Mol/L
Description	Annual average concentration of methane entering the flameless oxidation unit in year y

Source of data	Monitoring data provided by the project owner																							
Description of measurement methods and procedures applied	The concentration of outflow is measured by the gas analyzers installed before RTOs. PO regularly records the concentration. All electronic data and paper documents will be archived for two years following the end of the crediting period.																							
Frequency of monitoring/recording	Once per day																							
Value applied:	Not applicable ex-ante																							
Monitoring equipment	Gas analyzers																							
QA/QC procedures applied	The gas analyzer will be periodically checked and maintained. Calibration will be carried out once a year to ensure normal operation.																							
Purpose of data	Calculation of project emissions																							
Calculation method	The concentration of methane entering the oxidation system is calculated by the mean value of the values measured by four gas analyzers.																							
Comments	The concentration values are recorded every day and gathered at least once a week. The gas analyzers are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period. <table border="1"> <thead> <tr> <th>Monitoring equipment</th><th>Gas analyzer (C1)</th><th>Gas analyzer (C2)</th><th>Gas analyzer (C3)</th><th>Gas analyzer (C4)</th></tr> </thead> <tbody> <tr> <td>Type</td><td>LGA-4700</td><td>LGA-4700</td><td>LGA-4700</td><td>LGA-4700</td></tr> <tr> <td>Serial No.</td><td>AAM62140260</td><td>AAM62150004</td><td>AAM62150005</td><td>AAM62150044</td></tr> <tr> <td>Accuracy</td><td>± 5%</td><td>± 5%</td><td>± 5%</td><td>± 5%</td></tr> </tbody> </table>				Monitoring equipment	Gas analyzer (C1)	Gas analyzer (C2)	Gas analyzer (C3)	Gas analyzer (C4)	Type	LGA-4700	LGA-4700	LGA-4700	LGA-4700	Serial No.	AAM62140260	AAM62150004	AAM62150005	AAM62150044	Accuracy	± 5%	± 5%	± 5%	± 5%
Monitoring equipment	Gas analyzer (C1)	Gas analyzer (C2)	Gas analyzer (C3)	Gas analyzer (C4)																				
Type	LGA-4700	LGA-4700	LGA-4700	LGA-4700																				
Serial No.	AAM62140260	AAM62150004	AAM62150005	AAM62150044																				
Accuracy	± 5%	± 5%	± 5%	± 5%																				

Data / Parameter	DCH ₄ , exhaust,y
Data unit	tCH ₄ /m ³

Description	Density of methane corrected for pressure and temperature (P_{exhaust} and T_{exhaust} respectively) in the exhaust gases.		
Source of data	Monitoring data provided by the project owner		
Description of measurement methods and procedures applied	Density of inflow and outflow can be determined based on measured temperature and pressure.		
Frequency of monitoring/recording	Once per day		
Value applied:	Not applicable ex-ante		
Monitoring equipment	Thermometer and pressure gauge		
QA/QC procedures applied	The pressure P_{exhaust} and temperature T_{exhaust} for outflow density calculation is daily measured and recorded. PO regularly aggregated the data every month. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
Purpose of data	Calculation of project emissions		
Calculation method	Based on the following three equation: $PV=nRT, n=m/M, m=pV$ It can be inferred that: $p=PM/RT$, where P = pressure, V = volume, M=molar mass of the pure CH_4, T = temperature, R = gas constant		
Comments	The density is determined by CH_4 gas concentration, pressure and temperature in the outflow. And all the monitoring equipment are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
	Monitoring equipment	Temperature meter (T5)	Pressure meter (P5)
	Type	DT1311	DP3000
	Serial No.	205149	JY06360
	Accuracy	1%	Level 1

Data / Parameter	D _{CH₄, inflow,y}
Data unit	tCH ₄ /m ³
Description	Density of methane entering the flameless oxidation system corrected for pressure and temperature (P _{inflow} and T _{inflow} respectively).
Source of data	Monitoring data provided by the project owner
Description of measurement methods and procedures applied	Density of inflow and inflow can be determined based on measured temperature and pressure.
Frequency of monitoring/recording	Once per day
Value applied:	Not applicable ex-ante
Monitoring equipment	The gas analyzer (which thermometer and pressure gauge are assembly on)
QA/QC procedures applied	The pressure P _{inflow} and temperature T _{inflow} for inflow density calculation is daily measured and recorded. PO regularly record the data every day and aggregate the data every week. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Purpose of data	Calculation of project emissions
Calculation method	Based on the following three equation: $PV=nRT, n=m/M, m=pV$ It can be inferred that: $p=PM/RT$, where P = pressure, V = volume, M=molar mass of the pure CH₄, T = temperature, R = gas constant. The temperature and pressure of methane gas entering the oxidation system is calculated by the mean value of the values measured by four gas analyzers.

Comments

The temperature and pressure values are recorded every day and gathered at least once a week. The gas analyzers are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period.

Monitoring equipment	Gas analyzer (C1)	Gas analyzer (C2)	Gas analyzer (C3)	Gas analyzer (C4)
Type	LGA-4700	LGA-4700	LGA-4700	LGA-4700
Serial No.	AAM62140260	AAM62150004	AAM62150005	AAM62150044
Accuracy	±5%	±5%	±5%	±5%

Data / Parameter	FC _{i,j,y}
Data unit	t
Description	Quantity of fuel type i combusted in process j during the year
Source of data	Onsite measurements
Description of measurement methods and procedures applied	Use level gauges to monitor the diesel consumption. The gauge is calibrated once a year.
Frequency of monitoring/recording	Continuously measurement, recoded once per day
Value applied:	2.08
Monitoring equipment	Level gauge
QA/QC procedures applied	The quantity of consumed diesel is measured by the level gauge. Data is recorded when the diesel is used and is checked with the purchase records. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Purpose of data	Calculation of project emissions
Calculation method	-

Comments	The quantity is measured by the level gauge. Data was recorded when the diesel is used. All electronic data and paper documents will be archived for two years following the end of the crediting period.	
	Monitoring equipment	Level gauge
	Serial No.	21-12
	Accuracy	±5%

Data / Parameter	NCV _{i,y}
Data unit	GJ per mass or volume unit (e.g. GJ/m ³ , GJ/ton)
Description	Weighted average net calorific value of fuel type i in year y
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2019 Refinement to 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	Any future revision of the IPCC Guidelines will be taken into account
Value applied:	43.3
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	Applicable where Option B is used

Data / Parameter	EF _{CO2,i,y}
Data unit	tCO ₂ /GJ
Description	Weighted average CO ₂ emission factor of fuel type i in year y
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 Chapter 1 of Vol. 2 (Energy) of the 2019 Refinement to 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	Any future revision of the IPCC Guidelines will be taken into account
Value applied:	74800
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	Applicable where Option B is used

6.3 Monitoring Plan

The monitoring plan presented in this PD assures that real, measurable, long-term GHG emission reductions can be monitored, recorded and reported. It is a crucial procedure to identify the final VCUs of the project. This monitoring plan will be implemented by the project owner during the project operation. The details of the monitoring plan are specified as follows:

(A) Data and parameters to be monitored

Data and parameters to be monitored are listed below shows the positions of the monitoring

instruments and the table below lists the corresponding parameters monitored:

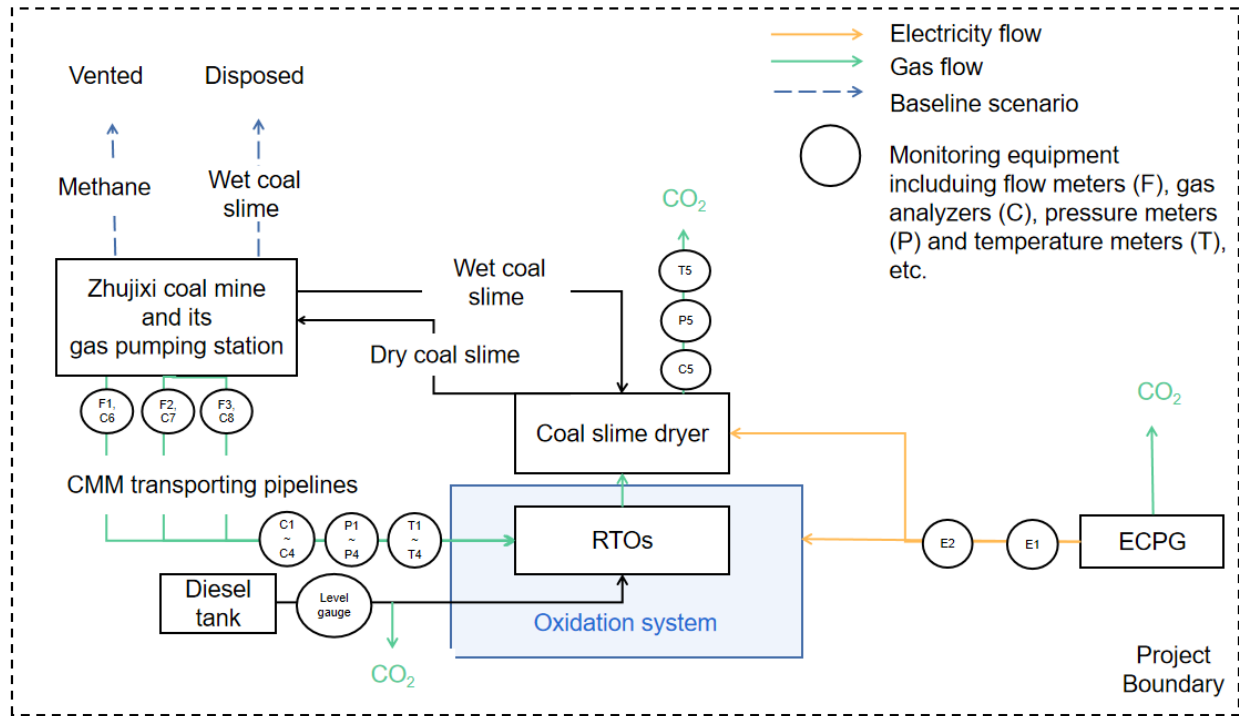


Figure 4 Project monitoring diagram

(B) Management Structure

The Project owner organizes a specific VCS team in project development department to be responsible for data collection, supervision and witness the whole process of data measuring and recording. A VCS manager is appointed to take full responsibility for the overall monitoring of the project. The monitoring and measurement of extracted gas, electricity generation and consumption etc. are carried out by a few designated monitoring officers. In addition, the Project developer appoints internal verifiers who is responsible for internal check of the measurement, collection of relevant receipts and invoices, and the calculation of the emission reductions. A monitoring and management manual of the project that identifies detailed duties and responsibilities of the relevant parties is developed and served as the basis of the project monitoring. Figure below shows the operation and management structure of the Project.

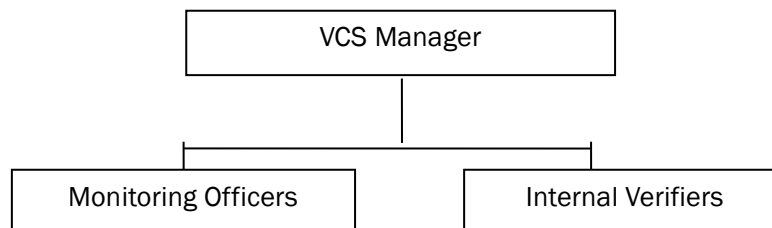


Figure 5 Operation and management structure of the project

(C) Data collection

Monitoring officers are responsible for data collection. Designated teams will read and collect the monitored data regularly. The computer system will automatically monitor and record relevant meter data. Automatic records will serve as the main data source for emission reductions calculation. All data files, relevant purchase invoices and sales receipts will be collected by a designated monitoring officer, who will prepare backup in time and archive all documents properly.

(D) Quality assurance

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. To assist in future verifications, the Project owner will preserve the calibration records, along with the data files of project monitoring.

Error check routines will be established on site and at the point of data storage to detect data measuring/transmission failures as well as malfunctions. In the case of malfunction of the meters, the meter supplier will provide technical support to engage the problem promptly and emission reductions during the corresponding period will be calculated conservatively.

The installation of the electricity metering equipment will fulfill the requirements of “JJG596-2012”. The accuracy should not be less than 0.5S. The installation of flow meters and gas analyzers will fulfill the local standard “JJG(Wan) 70-2019 Laser methane sensors for coal mines and JJG(Wan) 51-2016 Verification regulation of wind speed sensors for coal mines”. All the meters will be checked and maintained periodically.

(E) Data file management

All monitoring data will be electronically filed by the end of each month and the electronic data files will be archived in both disk copy and printed hard copy. Other documents in paper e.g. maps, forms and environment assessment reports will be preserved as well. All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the crediting period. The Project owner will provide original records and documents if necessary.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	MT _{PJ,s,i,y}
------------------	------------------------

Data unit	tCH ₄																								
Description	Methane from source s captured and destroyed by use i in the project activity in year y. MT_{PJ,s,i,y} is calculated by multiplying methane volume (measured by flow meters) and methane density $\rho_{i,n}$. All electronic data and paper documents will be archived for two years following the end of the crediting period.																								
Value applied:	<table> <tr> <th>Year</th><th>MT_{PJ,s,i,y} (tCH₄)</th></tr> <tr> <td>2021</td><td>418.065</td></tr> <tr> <td>2022</td><td>3,247.693</td></tr> <tr> <td>2023</td><td>1,593.863</td></tr> <tr> <td>Total</td><td>5,259.621</td></tr> </table>	Year	MT _{PJ,s,i,y} (tCH ₄)	2021	418.065	2022	3,247.693	2023	1,593.863	Total	5,259.621														
Year	MT _{PJ,s,i,y} (tCH ₄)																								
2021	418.065																								
2022	3,247.693																								
2023	1,593.863																								
Total	5,259.621																								
Comments	This parameter is monitored by three set of mass flow meters and gas analyzers that can measure quantity directly. The flow meters are calibrated by qualified third party Huainan Institute of Measurement and Testing Technology. Amount of methane consumed during plant operation are recorded by the computer automatically once every day, and data are gathered every month by staff. The monthly records provided by PO is cross-checked with the mass balance. The key information of the monitoring equipment is shown as below: <table> <tr> <td>Monitoring equipment</td><td>Flow meter (F1)</td></tr> <tr> <td>Type</td><td>GD3(A)</td></tr> <tr> <td>Serial No.</td><td>289000138</td></tr> <tr> <td>Accuracy</td><td>± 1.5%</td></tr> <tr> <td>Calibration date</td><td>09-October-2021 29-April-2022 12-April-2023</td></tr> <tr> <td>Validity date</td><td>08-October-2022 28-April-2023 11-April-2024</td></tr> </table> <table> <tr> <td>Monitoring equipment</td><td>Flow meter (F2)</td></tr> <tr> <td>Type</td><td>GD3(A)</td></tr> <tr> <td>Serial No.</td><td>289000139</td></tr> <tr> <td>Accuracy</td><td>± 1.5%</td></tr> <tr> <td>Calibration date</td><td>09-October-2021 29-April-2022 13-April-2023</td></tr> <tr> <td>Validity date</td><td>08-October-2022</td></tr> </table>	Monitoring equipment	Flow meter (F1)	Type	GD3(A)	Serial No.	289000138	Accuracy	± 1.5%	Calibration date	09-October-2021 29-April-2022 12-April-2023	Validity date	08-October-2022 28-April-2023 11-April-2024	Monitoring equipment	Flow meter (F2)	Type	GD3(A)	Serial No.	289000139	Accuracy	± 1.5%	Calibration date	09-October-2021 29-April-2022 13-April-2023	Validity date	08-October-2022
Monitoring equipment	Flow meter (F1)																								
Type	GD3(A)																								
Serial No.	289000138																								
Accuracy	± 1.5%																								
Calibration date	09-October-2021 29-April-2022 12-April-2023																								
Validity date	08-October-2022 28-April-2023 11-April-2024																								
Monitoring equipment	Flow meter (F2)																								
Type	GD3(A)																								
Serial No.	289000139																								
Accuracy	± 1.5%																								
Calibration date	09-October-2021 29-April-2022 13-April-2023																								
Validity date	08-October-2022																								

		28-April-2023 12-April-2024
	Monitoring equipment	Flow meter (F3)
	Type	GD3(A)
	Serial No.	289000140
	Accuracy	± 1.5%
	Calibration date	09-October-2021 29-April-2022 13-April-2023
	Validity date	08-October-2022 28-April-2023 12-April-2024
	Monitoring equipment	Gas analyzer (C6)
	Type	GJG100J
	Serial No.	2115096
	Accuracy	± 5%
	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024
	Monitoring equipment	Gas analyzer (C7)
	Type	GJG100J
	Serial No.	2115285
	Accuracy	± 5%
	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024
	Monitoring equipment	Gas analyzer (C8)
	Type	GJG100J
	Serial No.	2115281
	Accuracy	± 5%
	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024

Data / Parameter	MM _{i,y}	
Data unit	tCH ₄	
Description	Methane measured sent for heat generation in year y. MM_{i,y} (same as MT_{PJ,s,i,y}) is calculated by multiplying methane volume (measured by flow meters and methane density $\rho_{i,n}$). All electronic data and paper documents will be archived for two years following the end of the crediting period.	
Value applied:	Year	MM _i (tCH ₄)
	2021	418.065
	2022	3,247.693
	2023	1,593.863
	Total	5,259.621

Comments

This parameter is monitored by three set of mass flow meters and gas analyzers that can measure quantity directly. The flow meters are calibrated by qualified third party Huainan Institute of Measurement and Testing Technology. Amount of methane consumed during plant operation are recorded by the computer automatically once every day, and data are gathered every month by staff.

The key information of the monitoring equipment is shown as below:

Monitoring equipment	Flow meter (F1)
Type	GD3(A)
Serial No.	289000138
Accuracy	±1.5%
Calibration date	09-October-2021 29-April-2022 13-April-2023
Validity date	08-October-2022 28-April-2023 12-April-2024

Monitoring equipment	Flow meter (F2)
Type	GD3(A)
Serial No.	289000140
Accuracy	±1.5%
Calibration date	09-October-2021 29-April-2022 13-April-2023
Validity date	08-October-2022 28-April-2023 12-April-2024

Monitoring equipment	Flow meter (F3)
Type	GD3(A)
Serial No.	289000139
Accuracy	±1.5%
Calibration date	09-October-2021 29-April-2022 13-April-2023
Validity date	08-October-2022 28-April-2023 12-April-2024

Monitoring equipment	Gas analyzer (C6)
Type	GJG100J
Serial No.	2115096
Accuracy	±5%

	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024
	Monitoring equipment	Gas analyzer (C7)
	Type	GJG100J
	Serial No.	2115285
	Accuracy	±5%
	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024
	Monitoring equipment	Gas analyzer (C8)
	Type	GJG100J
	Serial No.	2115281
	Accuracy	±5%
	Calibration date	09-October-2021 30-April-2022 12-April-2023
	Validity date	08-October-2022 29-April-2023 11-April-2024

Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/ tCH ₄
Description	Global warming potential of methane from IPCC Fifth Assessment Report (AR5)
Value applied:	28
Comments	-

Data / Parameter	EC _{PJ,j,y}
------------------	----------------------

Data unit	MWh		
Description	Quantity of electricity consumed by the project electricity consumption source j in year y		
Value applied:	Year		EC _{PJ,j,y} (MWh)
	2021		154
	2022		1,677
	2023		985
	Total		2,816
Comments	The electricity meters are monthly recorded and confirmed. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
	Monitoring equipment	Electricity meter (main meter E1)	Electricity meter (back-up meter E2)
	Type	DSSD25	DTZ341
	Serial No.	0801756	2009513972000066
	Accuracy	0.5S	0.2S
	Calibration date	18-October-2021 28-April-2022 10-April-2023	18-October-2021 28-April-2022 10-April-2023
	Validity date	17-October-2022 27-April-2023 09-April-2024	17-October-2022 27-April-2023 09-April-2024

Data / Parameter	EFF _{i,y} (Eff _{ox,y})		
Data unit	-		
Description	Efficiency of methane destruction in use i		
Value applied:	Year	Eff _{ox,y}	Default value
	2021	94.84%	90%
	2022	96.37%	90%
	2023	96.39%	90%
	Average	95.87%	90%
Comments	The parameter is calculated with the formula:		
	$Eff_{ox,y} = 1 - \frac{PC_{CH_4,exhaust,y} \times D_{CH_4,correxh,y}}{PC_{CH_4,VAM,y} \times D_{CH_4,corrinflow,y}}$		
	PC _{CH₄,exhaust,y} and PC _{CH₄,VAM,y} represent “annual average concentration of methane in the flameless oxidation exiting the		

	flameless oxidation unit in year y” and “annual average concentration of methane in the gas flow entering the flameless oxidation unit” respectively. The two variations are measured by concentration meters on-site, recorded every day and aggregated at least once a week. $D_{CH_4,correxh,y}$ and $D_{CH_4,correinfl,y}$ represent “annual average density of methane corrected for pressure and temperature in the exhaust gases corrected to reference conditions” and “annual average density of methane entering the flameless oxidation unit corrected to reference conditions” respectively. All electronic data and paper documents will be archived for two years following the end of the crediting period. The calculation value of $Eff_{ox,y}$ and 90% (ex-ant value) will be compared and the minimum value will be taken
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Data / Parameter	$PC_{CH_4,exhaust,y}$												
Data unit	%												
Description	Annual average concentration of methane in the flameless oxidation exiting the flameless oxidation unit in year y												
Value applied:	<table> <tr> <th>Year</th><th>$PC_{CH_4,exhaust,y}$</th></tr> <tr> <td>2021</td><td>0.056%</td></tr> <tr> <td>2022</td><td>0.054%</td></tr> <tr> <td>2023</td><td>0.057%</td></tr> <tr> <td>Average</td><td>0.056%</td></tr> </table>	Year	$PC_{CH_4,exhaust,y}$	2021	0.056%	2022	0.054%	2023	0.057%	Average	0.056%		
Year	$PC_{CH_4,exhaust,y}$												
2021	0.056%												
2022	0.054%												
2023	0.057%												
Average	0.056%												
Comments	The gas analyzer is recorded every day and gathered at least once a week. And it is calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period. <table> <tr> <th>Monitoring equipment</th><th>Gas analyzer (C5)</th></tr> <tr> <td>Type</td><td>CGM10</td></tr> <tr> <td>Serial No.</td><td>SS238158</td></tr> <tr> <td>Accuracy</td><td>1%</td></tr> <tr> <td>Calibration date</td><td>24- August -2021 19- August -2022</td></tr> <tr> <td>Validity date</td><td>23- August -2022 18-August-2023</td></tr> </table>	Monitoring equipment	Gas analyzer (C5)	Type	CGM10	Serial No.	SS238158	Accuracy	1%	Calibration date	24- August -2021 19- August -2022	Validity date	23- August -2022 18-August-2023
Monitoring equipment	Gas analyzer (C5)												
Type	CGM10												
Serial No.	SS238158												
Accuracy	1%												
Calibration date	24- August -2021 19- August -2022												
Validity date	23- August -2022 18-August-2023												

Data / Parameter	PC _{CH4,VAM,y}				
Data unit	%				
Description	Annual average concentration of methane entering the flameless oxidation unit in year y				
Value applied:	Year		PC _{CH4,exhaust,y}		
	2021		1.02%		
	2022		1.41%		
	2023		1.50%		
	Average		1.31%		
Comments	The concentration values are recorded every day and gathered at least once a week. The gas analyzers are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period.				
	Monitoring equipment	Gas analyzer (C1)	Gas analyzer (C2)	Gas analyzer (C3)	Gas analyzer (C4)
	Type	LGA-4700	LGA-4700	LGA-4700	LGA-4700
	Serial No.	AAM62140260	AAM62150004	AAM62150005	AAM62150044
	Accuracy	± 5%	± 5%	± 5%	± 5%
	Calibration date	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023
	Validity date	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024

Data / Parameter	D _{CH4, exhaust,y}					
Data unit	tCH ₄ /m ³					
Description	Density of methane corrected for pressure and temperature (P _{exhaust} and T _{exhaust} respectively) in the exhaust gases.					
Value applied:	<table><tr><td>Year</td><td>D_{CH4, exhaust,y} (tCH₄/m³)</td></tr><tr><td>2021</td><td>0.00062</td></tr></table>		Year	D _{CH4, exhaust,y} (tCH ₄ /m ³)	2021	0.00062
Year	D _{CH4, exhaust,y} (tCH ₄ /m ³)					
2021	0.00062					

	2022	0.00061	
	2023	0.00062	
	Average	0.00062	
Comments	The density is determined by CH ₄ gas concentration, pressure and temperature in the outflow. These data are recorded every day and gathered at least once a week. And all the monitoring equipment are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period.		
	Monitoring equipment	Temperature meter (T5)	Pressure meter (P5)
	Type	DT1311	DP3000
	Serial No.	205149	JY06360
	Accuracy	1%	Level 1
	Calibration date	24-August-2021	24-August-2021
		19-August-2022	19-August-2022
	Validity date	23-August-2022	23-August-2022
		18-August-2023	18-August-2023

Data / Parameter	D _{CH₄} , inflow,y	
Data unit	tCH ₄ /m ³	
Description	Density of methane entering the flameless oxidation system corrected for pressure and temperature (P _{inflow} and T _{inflow} respectively).	
Value applied:	Year	D _{CH₄} , inflow,y (tCH ₄ /m ³)
	2021	0.00066
	2022	0.00065
	2023	0.00065
	Average	0.00065

Comments

The density is determined by CH₄ gas concentration, pressure and temperature in the inflow. The temperature and pressure values are recorded every day and gathered at least once a week. The temperature and pressure meters are part of the analyzers which are calibrated once a year. All electronic data and paper documents will be archived for two years following the end of the crediting period.

Monitoring equipment	Gas analyzer (C1)	Gas analyzer (C2)	Gas analyzer (C3)	Gas analyzer (C4)
Type	LGA-4700	LGA-4700	LGA-4700	LGA-4700
Serial No.	AAM62140260	AAM62150004	AAM62150005	AAM62150044
Accuracy	± 5%	± 5%	± 5%	± 5%
Calibration date	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023	18-October-2021 28- April -2022 10-April-2023
Validity date	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024	17-October-2022 27- April -2023 09-April-2024

Data / Parameter	FC _{i,j,y}										
Data unit	t										
Description	Quantity of fuel type i combusted in process j during the year y										
Value applied:	<table> <tr> <th>Year</th><th>FC_{i,j,y} (t)</th></tr> <tr> <td>2021</td><td>2.4</td></tr> <tr> <td>2022</td><td>0</td></tr> <tr> <td>2023</td><td>0</td></tr> <tr> <td>Total</td><td>2.4</td></tr> </table>	Year	FC _{i,j,y} (t)	2021	2.4	2022	0	2023	0	Total	2.4
Year	FC _{i,j,y} (t)										
2021	2.4										
2022	0										
2023	0										
Total	2.4										
Comments	The quantity is measured by the level gauge. Data was recorded when the diesel is used and is checked with the purchase records. All electronic data and paper documents will be archived for two years following the end of the crediting period. <table> <tr> <td>Monitoring equipment</td><td>Level gauge</td></tr> <tr> <td>Serial No.</td><td>21-12</td></tr> <tr> <td>Accuracy</td><td>± 5%</td></tr> <tr> <td>Calibration date</td><td>24-August-2021 20-August-2022</td></tr> <tr> <td>Validity date</td><td>23-August-2022 19-August-2023</td></tr> </table>	Monitoring equipment	Level gauge	Serial No.	21-12	Accuracy	± 5%	Calibration date	24-August-2021 20-August-2022	Validity date	23-August-2022 19-August-2023
Monitoring equipment	Level gauge										
Serial No.	21-12										
Accuracy	± 5%										
Calibration date	24-August-2021 20-August-2022										
Validity date	23-August-2022 19-August-2023										

Data / Parameter	NCV _{i,y}
Data unit	GJ per mass unit (e.g GJ/ton)
Description	Weighted average net calorific value of fuel type i in year y
Value applied:	43.3
Comments	-

Data / Parameter	EF _{CO₂,i,y}
Data unit	tCO ₂ /GJ
Description	Weighted average CO ₂ emission factor of fuel type i in year y
Value applied:	74800
Comments	-

7.2 Baseline Emissions

According to the methodology ACM0008 (version 08.0) and statement in section 5.1 baseline emissions, the parameter BE_y is ex-post determined as the following equations:

$$BE_{MR,y} = MT_{PJ,s,i,y} \times GWP_{CH_4} \quad (3)$$

$$BE_y = BE_{MR,y} \quad (4)$$

BE_y ex-post calculated value during this monitoring period (14-December-2021 ~ 31-July-2023) are as the follows.

Table 5 The ex post calculation of BE_y

Year	GWP _{CH₄}	MT _{PJ,s,i,y}	BE _{MR,y}
2021	28	418.065	11,705
2022	28	3,247.693	90,935
2023	28	1,593.863	44,628
Total	-	-	147,268

Based on the monitored data and parameters of section 6.1 and 7.1, BE_y is ex post calculated value during this monitoring period (14-December-2021 ~ 31-July-2023) as the follows.

$$BE_y = BE_{MR,y} = 147,268 \text{ tCO}_2\text{e}$$

7.3 Project Emissions

According to the methodology ACM0008 (version 08.0) and statement in section 5.2, project emissions, the parameter PE_y is ex-post determined as the following equations:

$$PE_y = PE_{ME,y} + PE_{MD,y} + PE_{UM,y} \quad (5)$$

$$PE_{ME,y} = PE_{EC,y} + PE_{FC,j,y} \quad (6)$$

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y}) \quad (7)$$

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (8)$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (9)$$

$$PE_{MD,y} = \sum_i MD_{i,y} \times CEF_{CH4} \quad (10)$$

$$MD_{i,y} = MM_{i,y} \times Eff_{i,y} \quad (11)$$

$$\rho_{i,n} = \frac{P_n \times MM_i}{R_u \times T_n} \quad (12)$$

Based on the monitored data and parameters of section 6.1 and 7.1, PE_y is ex post calculated value during this monitoring period as the follows:

1. Project emissions from the energy use to capture and to use methane ($PE_{ME,y}$)

Parameter	Unit	Value 2021	Value 2022	Value 2023	Total
$EC_{PJ,j,y}$	MWh	154	1,677	985	-
$EF_{EF,j,y}$ ($EF_{grid,CM,y}$)	tCO ₂ /MWh	1.3	1.3	1.3	-
$TDL_{j,y}$	%	20%	20%	20%	-
$FC_{i,j,y}$	t	2.40	0	0	-
$COEF_{i,y}$	tCO ₂ /t	3.24	3.24	3.24	-
$NCV_{i,y}$	TJ/Gg	43.30	43.30	43.30	-
$EF_{CO2,i,y}$	kg/TJ	74800	74800	74800	-

$PE_{ME,y}=PE_{EC,y}$	tCO ₂ e	249	2,616	1,537	4,402
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2. Project emissions from destruction of captured methane ($PE_{MD,y}$)

Parameter	Unit	Value 2021	Value 2022	Value 2023	Total
MM _{i,y} (volume)	Nm ³ CH ₄	584,167	4,538,040	2,227,123	-
CH ₄ density	t/Nm ³	0.00071566	0.00071566	0.00071566	-
MM _{i,y}	tCH ₄	418.065	3,247.693	1,593.863	-
EFF _{i,y} (Eff _{ox,y})	none	90.00%	90.00%	90.00%	-
MD _{i,y}	tCH ₄	376.2583309	2922.92411	1434.476459	-
CEF _{CH4}	tCO ₂ /tCH ₄	2.75	2.75	2.75	-
PE _{MD,y}	tCO ₂ e	1,035	8,039	3,945	13,019

3. Project emissions from un-combusted methane ($PE_{UM,y}$)

Parameter	Unit	Value 2021	Value 2022	Value 2023	Total
GWP _{CH4}	tCO ₂ /tCH ₄	28	28	28	-
MM _{i,y}	tCH ₄	418.065	3,247.693	1,593.863	-
EFF _{i,y} (Eff _{ox,y})	none	90.00%	90.00%	90.00%	-
PE _{UM,y}	tCO ₂ e	1,171	9,094	4,463	14,728

4. Project Emissions (PE_y)

Year	PE _y
2021	2,455
2022	19,749
2023	9,945
Total	32,149

Thus, during this monitoring period from 14-December-2021 to 31-July-2023, the total project emission of the project is 32,149 t CO₂e.

7.4 Leakage Emissions

No leakage effects are accounted for under this methodology.

7.5 GHG Emission Reductions and Carbon Dioxide Removals

As described in section 6.2, 6.3 and 6.4 above, in this monitoring period from 14-December-2021 to 31-July-2023:

BEy = 147,268 tCO₂e;

PEy = 32,149 tCO₂e;

LEy = 0 tCO₂e;

ERy = BEy – PEy – LEy = 115,119 tCO₂e

This monitoring period is from 14-December-2021 to 31-July-2023 (Both days included), with totally 595 days. The actual emission reductions in this monitoring period (595 days) are 115,119 tCO₂e.

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCU (tCO ₂ e)	Removal VCU (tCO ₂ e)	Total VCU (tCO ₂ e)
2021 (14-December-2021~31-December-2021)	11,705	2,455	0	9,250	0	9,250
2022	90,935	19,749	0	71,186	0	71,186
2023 (01-January-2023~31-July-2023)	44,628	9,945	0	34,683	0	34,683
Total	147,268	32,149	0	115,119	0	115,119

Based on the annual estimated emission reductions, the amount of emission reductions for this monitoring period would be 246,294 tCO₂e. which is 53.26% lower than the estimation. The reduction is reasonable because the amount of destroyed CH₄ depends on the amount that the mine provides.

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
2021 (14-December-2021~31-	7,451	9,250	24.14%	Reasonable because the amount of destroyed CH ₄ depends on the amount that the mine provides.

December-2021)				
2022	151,088	71,186	-52.88%	Reasonable because the amount of destroyed CH ₄ depends on the amount that the mine provides.
2023 (01-January-2023~31-July-2023)	87,755	34,683	-60.48%	Reasonable because the amount of destroyed CH ₄ depends on the amount that the mine provides.
Total	246,294	115,119	-53.26%	Reasonable because the amount of destroyed CH ₄ depends on the amount that the mine provides.

APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

Not applicable.