



LIYANG 15 MW LOW-CONCENTRATION CMM POWER GENERATION PROJECT



Document Prepared by Leon Low-Carbon and Environmental Protection Science and Technology (Beijing) Co., Ltd & Green Inclusive Technology (Beijing) Co., Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Liyang 15 MW Low-concentration CMM Power Generation Project (hereinafter referred to as the Project) utilizes the low concentration coal mine methane (CMM) from Liyang coal mine for power generation to supply electricity to the North China Power Grid (NCPG). Waste heat generated by the gas generators is utilized for heat supply to the coal mine. The Project is located in South Liyang Village, Liyang Township, Heshun County, Jinzhong City, Shanxi Province, China.

Twenty-four sets of CMM gas generators and one set of steam turbine generator are planned to be installed to generate with a total installed capacity of 15MW ($20 \times 0.6\text{MW} + 4 \times 0.5\text{MW} + 1\text{MW}$), destroying 25.5 million Nm^3 of methane annually. After the full operation of the Project, the expected annual exported electricity will be 77,550 MWh which will be supplied to the NCPG and the expected average annual GHG emission reductions will be 456,021 tCO_2e , with the total emission reduction of 4,560,209 tCO_2e .

The technical process of the Project is shown in Figure 1-1. Low concentration CMM is delivered through methane extraction pumps to the pre-treatment system for safety treatment and then goes into the gas generators for power generation. Then, the waste heat from gas generators is recovered by the waste heat boilers, and saturated steam from waste heat boilers is supplied to the steam turbine generator to produce electricity. Surplus saturated steam is supplied to the coal mine to replace part of the heat that would be generated by the gas-fired boilers. The generated electricity is supplied to the NCPG. To be conservative, heat supply is disregarded in the calculation, claiming no emission reduction.

The Project uses domestic gas generators. After site survey and taking advice from professional experts, the preparation organization of Feasibility Study Report (FSR) determined the annual operating hours to be 5,500 hours in the FSR, and thus the plant load factor (PLF) is 0.6279¹.

The equipment employed in the Project is all produced domestically without technology transfer. As shown in Figure 1-1, the Project installs gas analyser, flow meters, thermometers and manometers to respectively monitor the methane concentration and CMM volume sent to the CMM power plants. Bidirectional meters are installed to monitor the electricity export and import. Detailed monitoring information can be found in section 3 and section 4.

The project started construction on 1-March-2021 and operated on 1-March-2022. It is constructed in phases. The first phase has already seen the construction of 20 sets of CMM gas generators with each capacity of 0.6MW, resulting in a total installed capacity of 12MW

¹ $0.6279 = 5,500 \text{ hours} / 8,760 \text{ hours}$

(20*0.6MW) to utilize low concentration CMM for power generation. The remaining 3MW (4*0.5MW+1MW) will depend on the availability of CMM volume and concentration.

The emission reductions of the Project come from two sources: 1) Methane (CH₄) emissions because of the previously vented gas that will be captured and destroyed in the project scenario; 2) CO₂ emissions from the production of the equivalent amount of electricity replaced by the Project that would otherwise have been generated by power plants dominated by fossil fuel fired. It is estimated that in the 10 years crediting period of the Project (from 01-March-2022 to 29-February-2032), the expected average annual GHG emission reductions will be 456,021tCO₂e, with the total emission reduction of 4,560,209 tCO₂e. During this monitoring period from 01-Mar-2022 to 31-Dec-2024, the actual operating capacity of the project is 12MW. The total electricity supply to NCPG is 118,856.36MWh. The total amount of methane destructured is 26,787.68 tCH₄, and the total achieved emission reductions are 757,901 tCO₂e.

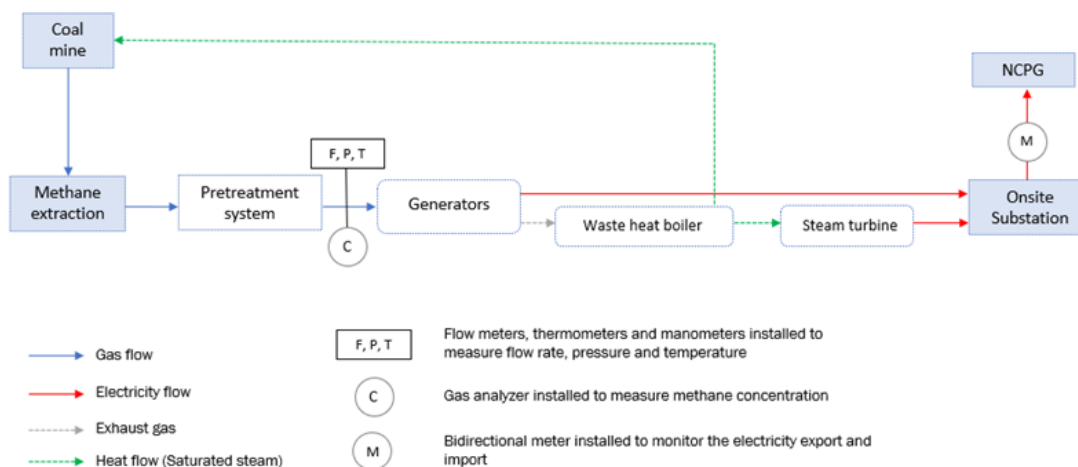


Figure 1-1 Project Process

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	22/11/2023-23/11/2023 (On-site audit)	VCS	TÜV Rheinland Energy & Environment GmbH	/
1st periodical VCS Verification	01-Mar-2022 to 31-Dec-2024	VCS	China Classification Society Certification Co. Ltd. (CCSC)	2 years and 305 days (1036 days)

1.3 Sectoral Scope and Project Type

Sectoral scope ²	1
Project activity type	Energy industries (renewable - / non-renewable sources)

Sectoral scope ¹	8
Project activity type	Mining/mineral production

1.4 Project Proponent

Organization name	Beijing Yonder Environmental Energy Technology Co., Ltd
Contact person	Wang Chao
Title	Manager
Address	Floor 7, East Tower, Zhonghai International, Wanbolin District, Taiyuan, Shanxi Province
Telephone	+86 183 0341 5669
Email	wangchao@china-yonder.com

1.5 Other Entities Involved in the Project

Organization name	Shanxi Shengdong Qingtian New Energy Co., Ltd.
Role in the project	Operator
Contact person	Wang Chao
Title	Manager
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Email	wangchao@china-yonder.com

Shanxi Shengdong Qingtian New Energy Co., Ltd. operates the Project. Shanxi Shengdong Qingtian New Energy Co., Ltd. is Beijing Yonder Environmental Energy Technology Co., Ltd.'s fully subsidiary.

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

Organization name	Leon Low-Carbon and Environmental Protection Science and Technology (Beijing) Co., Ltd.,
Role in the project	Consultant
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Organization name	Green Inclusive Technology (Beijing) Co., Ltd
Role in the project	Developer
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Title	Director
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1.6 Project Start Date

Project start date	01-March-2022
Justification	According to VCS standard, the project start date is the date on which activities that lead to the generation of GHG emission reductions or removals are implemented. For this project, the project start date 01-March-2022 is when the project started operation, thus the project start date is 01-March-2022

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable
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	☒ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	01-March-2022 to 29-February-2032

1.8 Project Location

The Project is located in South Liyang Village, Liyang Township, Heshun County, Jinzhong City, Shanxi Province, China. The geographical coordinates for the project site are east longitude 113°37'23" and north latitude 37°24'24".

The geographic locations of the involved coal mines are shown in Figure 1-2.



Figure 1-2 Location of the project

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0008	Abatement of methane from coal mines	8.0
Tool	TOOL02	Combined tool to identify the baseline scenario and demonstrate additionality	07.0
Tool	TOOL05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	07.0
Tool	TOOL24	Common practice	03.1
Tool	TOOL27	Investment analysis	13.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

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

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

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

☐ Yes ☒ No

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

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

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

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

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

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

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

☐ Yes ☒ No

1.12 Sustainable Development Contributions

The Project is to utilize the extracted CMM with low concentration methane concentration to generate electricity and supply the electricity to NCPG. The Project is located in South Liyang Village, Liyang Township, Heshun County, Jinzhong City, Shanxi Province, China, where all the sustainable contribution exactly happens.

The Project contributes to sustainable development in the following ways:

- The Project helps promote utilization of clean energy. After the full operation of the Project, the expected annual exported electricity will be 77,550 MWh, which will be supplied to the NCPG. Thus, the Project achieves a self-defined indicator “Contribution to clean energy generation”.
- The Project helps increase the income of local residences and accelerate economic development in rural areas. Over 25 employment positions for local villagers have been provided, which increase income of local residences and accelerate economy development in rural areas. Thus, the Project achieves a self-defined indicator Contribution to Local Employment: Competitive Payroll and Job Creation”.
- The Project is expected to achieve a total GHG emission reduction of 456,021 tCO₂e per year during the whole crediting period. Thus, the Project achieves SDG 13 “Take urgent action to combat climate change and its impacts”³.

³ <https://sdgs.un.org/goals/goal13>

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
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1)	Self-defined indicator	Contribution to clean energy generation	Implemented activities to increase	The project activity is designed to introduce CMM-based power generation to displace the carbon-intensive electricity that would be dominantly generated by fossil fuels in NCPG as a business-as-usual scenario in the project area. The project continuously monitors the electricity during each monitoring period. From 01-March-2022 to 31-December-2024, at the current capacity of 12MW, the project activity has exported 118,856.36 MWh electricity in total, which has been supplied to the NCPG. The public can have access to clean energy by reducing the use of fossil fuels. This contributes to one of the China's actions for promoting sustainable developing, "By 2030, increase the share of non-fossil fuels in primary energy consumption to about 25 percent"⁴.	Since the monitoring period covered by this report is the first monitoring period of this project, from 01-March-2022 to 31-December-2024. The contribution to clean energy generation over the project lifetime is a total of 118,856.36 MWh of electricity to the NCPG at a capacity of 12 MW.
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⁴ https://www.gov.cn/zhengce/content/2021-10/26/content_5644984.htm

2)	Self-defined indicator	Contribution to Local Employment: Competitive Payroll and Job Creation	Implemented activities to increase	According to the statistics released by the People's Government of Shanxi Province, the average annual wage of urban residents in private sector in Shanxi Province was 51,010 RMB in 2024, with a nominal increase of 1.1% year-on-year⁵. Historical data from the Shanxi Statistical Yearbook show that the average wage was 47,275 RMB⁶ in 2022 and 50,542 RMB⁷ in 2023. As a private sector entity, the annual average payroll for employees of this project, from 2022 to 2024, is approximately 80,000, 85,000 and 90,000 RMB. This is decent compared to the local average level. In addition, the project creates an average of 27 job positions annually.	This is the first monitoring period. During the project lifetime from 01-March-2022 to 31-December-2024, the project has provided an average of 27 jobs annually with a competitive average payroll that has increased from 80,000 to 90,000 RMB between 2022 and 2024.
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⁵ <https://m12333.cn/policy/paisw.html>

⁶ <https://tjj.shanxi.gov.cn/tjsj/tjnj/nj2023/zk/indexch.htm>

⁷ <https://tjj.shanxi.gov.cn/tjsj/tjnj/nj2024/zk/indexch.htm>

3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The Project is to utilize the extracted CMM with low concentration methane concentration for electricity generation to avoid methane emissions and CO₂ emissions from the production of the equivalent amount of electricity replaced by the Project that would otherwise have been generated by power plants dominated by fossil fuel fired. During this monitoring period from 01-March -2022 to 31-December-2024, the Project has achieved GHG emission reduction of 757,901 tCO₂e in total.	This is the first monitoring period. During the project lifetime from 01-March-2022 to 31-December-2024, the project has successfully utilized the extracted low-concentration CMM for power generation, achieving a total GHG emission reduction of 757,901 tCO₂e by displacing fossil fuel-based electricity and avoiding methane emissions.
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1.13 Commercially Sensitive Information

No commercially sensitive information is included in this project. Therefore, no commercially sensitive information needs to be excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Since the stakeholder identified in the project description has not changed since validation, no more information is required to be provided in this part. Stakeholders identified in this project are relevant personnel of Liyang Coal Mine, employees of the program, local villagers, and government officials.

Stakeholder Identification

Before stakeholders' consultation, stakeholders identified in this project are relevant personnel of Liyang Coal Mine, local villagers, and government officials.

	Item	Distribution	Quantity	Percentage
	Number of stakeholders surveyed	Male	34	68%
		Female	16	32%
	Age	<25	4	8%
		25-45	27	54%
		46-55	7	14%
		>55	12	24%
	Education	Junior high school or below	32	64%
		Senior high school	14	28%
		College or above	4	8%
	Occupation	Worker	15	30%
		Farmer	22	44%
		Management personnel	4	8%
		Civil servant	4	8%
		Unspecified	5	10%
Legal or customary tenure/access rights	The Project is situated within the boundaries of an existing coal mine site. As such, the land use and access rights are governed by applicable legal framework and existing agreements. The project activities do not involve alterations to the existing legal or customary tenure/access rights of stakeholders, indigenous people (IPs), local communities (LCs), or customary rights holders, as the land is already designated for industrial purposes.			
	The land use and access rights of the Project are governed according to applicable legal framework and existing agreements, since the Project is constructed within the boundaries of an existing coal mine site. Plus, the project activities do not involve alterations to the existing legal or customary tenure/access rights of stakeholders, indigenous people (IPs), local communities (LCs), or customary rights holders, as the land is already designated for industrial purposes.			

Stakeholder diversity and changes over time	The project has no impact on the social, economic, and cultural diversity within stakeholder groups. Stakeholders include diverse social, economic, and cultural groups such as relevant personnel of Liyang Coal Mine, employees of the program, local villagers, and government officials. - Coal Mine Personnel: Technically skilled, with a focus on safety and engineering. - Program Employees: Diverse professionals blending local and external expertise with varied income levels. - Local Villagers: Rural residents with strong cultural identity. - Government Officials: Administrators balancing development with environmental and social priorities. Stakeholders have distinct priorities, yet collaborate through employment opportunities, regulations, and dialogue. No particular changes in each group over time.
Expected changes in well-being	The project is expected to make positive changes in the local environment, work opportunities and clean electricity supply.
Location of stakeholders	Villages, the coal mine and local government
Location of resources	Villages, the coal mine and local government

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	The project owner has set up an on-going communication mechanism, which includes posting notice boards, regularly convening stakeholder meetings, distributing survey questionnaires and responding to various stakeholders. Communications with Local stakeholders are being carried out at periodic intervals. Moreover, the ongoing Communication form provides the contact number and email address of project proponent and specialized personnel is assigned to respond to the information. Local stakeholders can also raise their
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	concerns and opinions directly by making a phone call to the project proponent. As soon as there are any questions reaching out, the project proponent can get the timely information.
Date(s) of stakeholder consultation	14-November-2023
Communication of monitored results	The monitoring results were posted on notice boards and communicated in stakeholder meetings to make sure stakeholders were fully noticed in a timely manner. No negative opinions or complaints have been received so far.
Consultation records	For on-going communication with stakeholders, the project proponent is committed to carry out questionnaire surveys to document the outcomes of the stakeholder consultation. The document contains the proposer information, time, contact information, relevant questions or suggestions, solutions and responses. Respondents including relevant personnel of Liyang Coal Mine, local villagers, and government officials by the project owner are asked to express their views on the operation of the project in the context of their own real-life situation. To make sure all the stakeholders to be aware of the potential impact of the project on their life, survey questionnaires were distributed to relevant personnel of Liyang Coal Mine, local villagers, and government officials by the project owner on 14-November-2020 for the first time. The survey questionnaire was designed to assess the project impacts on the local environment and social economic development. The survey showed no negative opinions or complaints. To track potential sentiment changes for stakeholders during the implementation of the project and make clear whether there are any ongoing or unresolved conflicts emerging or exacerbating in the meantime, survey questionnaires were distributed the second time to relevant personnel of Liyang Coal Mine, local villagers, and government officials by the project owner on 14-November-

2023, following the first time on 14-November-2020. A total of 50 questionnaires were distributed, all of which were returned. The survey questionnaire was designed to assess the impact of the project after implementation specifically on the local environment and social economic development and shows that the project is well accepted by residents.

None of the respondents felt that the project had a clear harmful impact and all the respondents agreed in the questionnaire that the project has had at least one positive impact.

100% of the respondents held the opinion that the project hasn't caused any negative environmental impact so far. 92% of the respondents admit the positive impact of the project on individuals and families. 90% of the respondents claim that the project has brought benefits to the local community, with the majority believing that the project helps improve the level of sustainable local development, reduce environmental pollution and its health impacts, and increase employment opportunities.

In terms of coal mine production safety, 94% of the respondents believe the project is free from any negative impact on coal mine safety.

As shown in the results table, there are no ongoing or unresolved conflicts, and the project does not exacerbate nor influence the outcomes of unresolved conflicts.

Question	Count		
Does it cause environmental pollution?	Yes	No	Uncertain
	0	50	0
Does it affect the safety of production of coal mines?	Yes	No	Uncertain
	1	47	2
What impact has it had on you and your family?	Positive	Negative	No impact

		46	1	3
	Impact on local economic development?	Positive	Negative	No impact
		49	1	0
	Positive impact on the local community?	Yes	No	Uncertain
		45	0	5
	Impact on the power grid?	Positive	Negative	No impact
		49	0	1
	What is your attitude towards the project?	Support	Oppose	Uncertain
		50	0	0
Stakeholder input	Throughout the project's operation, stakeholder feedback—gathered through surveys, phone calls, and other means—will be collected and consistently reported to the company's management. If any concerns arise regarding environmental or safety issues, the designated responsible personnel will be immediately informed to conduct inspections and take corrective actions. A report on these concerns will also be promptly submitted to the management.			

2.1.3 Free, Prior, and Informed Consent

Consent	The project proponent (PP) provided detailed information about the project to the stakeholders, resulting in a transparent agreement that the project will benefit the local area. Currently, there are no ongoing or unresolved conflicts.
Outcome of FPIC	The project is located on a coal mine site and therefore does not involve encroaching on land, relocating people without consent, and forcing physical or economic displacement. Local stakeholders support the Project's construction. The survey shows that a majority of surveyed local stakeholders think the project will help improve the living conditions of local people and promote local economic development

	without adverse environmental impact. Therefore, the survey shows that the stakeholders are supportive of the project.
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2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
No grievances were received.	N/A. There is a Comment Collection Book about the project at the entrance of the project owner's company. Stakeholders can register any opinions and suggestions about the project in it at any time or directly reflect their opinions by calling the number on the front cover of the Comment Collection Book.

2.1.5 Public Comments

Summary of comments received	Actions taken
No comment received	N/A

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Beijing Yonder Environmental Energy Technology Co., Ltd is a national high-tech enterprise and a national specialized, special and new “small giant” enterprise. Founded in 2007, the company is a distributed energy service provider focusing on the comprehensive development and utilization of coalbed methane, photovoltaic power generation, natural gas heating, biogas power generation, integrated energy services and other areas of investment, construction, operation, and equipment manufacturing as a whole under Yonder Group. Since its establishment, the company's projects have achieved a cumulative carbon emission reduction of more than 27 million tons, equivalent to planting more than 6 million mu of forests and saving more than 1.8 million tons of standard coal. The project proponent has many years of experience in coal mine gas utilization and has operated the registered VCS projects Huineng Low Concentration Coal Mine Methane Utilization Project (VCS ID 2830) and CMM power generation project in the new auxiliary shaft of No8 coal mine of Hebi Coal Group (VCS ID 3705).

2.2.2 Risk assessment

Risk identified	Mitigation or preventative measure(s) taken
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Natural and human-induced risks to stakeholders' wellbeing	No risk identified	The project has secured both project approval and Environmental Impact Assessment (EIA) approval. As such, it complies with all regulatory and legal requirements established by the Chinese government regarding environmental, health, and safety standards. Additionally, local stakeholders have not raised any negative concerns regarding the project's construction and operation. Consequently, the project does not involve the requisition of other natural or cultural resources and has no adverse impact on the well-being of stakeholders
Risks to stakeholder participation	No risk identified	The on-going communication mechanism used in stakeholder engagement in this project, such as Comment Collection Book and survey questionnaires, and timely response to various stakeholders, aims to reduce the risks to stakeholder participation to its minimum by making the whole process as easy and straightforward as possible to understand and engage for stakeholders. This goal has been well achieved so far, which is verified directly by the participation and callback rates of the questionnaires sent both before and during the implementation of the project. Fifty questionnaires were distributed and all of them have been recollected.

Working conditions	No risk identified	According to Labor Law of the People's Republic of China, employees in this project are provided with an environment and working conditions that ensure the minimum conditions of well-being. The project owner complies with all relevant laws. Meanwhile, the project has acquired both project approval and Environmental Impact Assessment (EIA) approval, which signifies that it adheres to all regulatory and legal requirements established by the Chinese government in terms of environment, health, and safety. As per the EIA, the project owner has developed safety production rules, regulations, and operating procedures, and formulated and implemented a safety production education and training program. These initiatives ensure the effective allocation of resources for safety production, enable the timely elimination of safety hazards, and facilitate the standardization of safety production practices.
Safety of women and girls	No risk identified	To safeguard the physical and mental well-being of minors, the State Council has issued the "Regulations on the Prohibition of Child Labor ⁸ ", which explicitly forbids employers from hiring individuals under the age of 16.

⁸ Prohibition of Child Labor Regulations

		Additionally, China has enacted the "Special Provisions on Labor Protection for Women Workers⁹." As a result, the Project will not expose women and girls to any additional risks or hazards. Furthermore, in accordance with the Labor Contract, no girls have been recruited, and the Project ensures equal pay for both women and men. The project owner complies with all relevant laws. No particular harm to women and girls in this project.
Safety of minority and marginalized groups, including children	No risk identified	Minority and marginalized groups are not covered by this project. Especially, the country has strict prohibitions for child labor. For example, China's labor law protects vulnerable groups, including the protection of minors and the protection of workers in specific situations. The project owner complies with all relevant laws. And according to Employee List, the project has not hired child labor. Thus, the project has no impact on safety of minority and marginalized groups.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical	No risk identified	Air Pollution: During the construction phase, the project owner set up construction fences at the construction site and installed spill prevention measures under the fences to

⁹ [Special Provisions on Labor Protection for Women Workers](#)

pesticides and fertilizers)		prevent dust from escaping. At the same time, the project owner promptly took dust suppression measures such as watering and dust suppression for the dust generated by earth excavation and backfilling. When transport vehicles left the site, their bodies and tires were washed clean. Vehicles that were prone to produce dust were covered with waterproof cloth, and vehicle speed was controlled reasonably; overloading was not allowed. During the operation phase, after adopting measures such as gas treatment and generator unit design control, the atmospheric pollutants emitted by this project can meet the stage standard requirements of "Emission limits and measurement methods of pollutants from automotive compression-ignition and gas combustion ignition engines" (GB17691-2005), which did not cause a significant environmental impact. Wastewater: During the construction phase, the wastewater generated included wastewater from the sand and gravel processing system, wastewater from construction equipment washing, and wastewater from oil spills from construction machinery that flowed into surface runoff. The wastewater was treated in an oil-water separator and returned to
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		the construction site for reuse, without discharge. During the operation phase, circulating cooling water and concentrated reverse osmosis water entered the mine water treatment system through the sewage collection system for treatment, without discharge. Domestic wastewater was pretreated by a septic tank and then entered the sewage collection system and then sent to coal miner's domestic sewage treatment facilities for treatment, without discharge. Noise: During the construction phase, to reduce the environmental pollution caused by construction noise, the project owner used low-noise construction machinery and construction methods. High-noise machinery use was strictly prohibited at night (10pm - 6am) during construction. During the operation phase, the project owner used low-noise equipment, performed foundation shock absorption, installed mufflers, and maintained protective facilities regularly to ensure their normal effectiveness. Solid Waste: During the construction phase, due to the small construction area of this project, all the excavated earth was used for construction backfill, without generating waste soil.
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		During the operation phase, hazardous waste temporary storage rooms were set up to store hazardous waste such as waste lubricating oil and waste cotton yarn, which were regularly treated by enterprises with relevant processing qualifications entrusted by the project owner. The domestic waste generated by the project was collected in enclosed garbage cans at the station and regularly sent to designated garbage collection points for disposal. In summary, through the measures taken by the project owner, the project does not have a negative impact on the environment and/or socio-economic aspects.
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ¹⁰	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	According to Labor Law of the People's Republic of China ¹¹ , it is illegal to discriminate on grounds of race, nation, sex or religion. The project owner obeys and will always obey the law. No

¹⁰ The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

¹¹ [Labor Law of the People's Republic of China](#)

		discrimination has occurred or will occur.
Sexual harassment	No risk identified	China's Civil Code ¹² explicitly prohibits sexual harassment and clearly contains clear provisions on the legal responsibility for sexual harassment. The project owner obeys and will always obey the law by setting up strict working processes and management systems to regulate employee behavior. For any violations of relevant policies of the company, severe penalties will be enforced.
Gender equity in labor and work	No risk identified	According to Labor Law of the People's Republic of China, Law of the People's Republic of China on the Protection of Women's Rights and Interests¹³, and the Special Provisions on Labor Protection for Women Workers¹⁴, it is illegal to discriminate on sex. The project owner obeys and will always obey the law. In this monitoring period, a total number of over 25 employees are hired for this project—According to the Labor Contract, female employees enjoy equal pay for equal work.
Forced labor	No risk identified	The Labor Law ¹⁵ of the People's Republic of China expressly

¹² [China's Civil Code](#)

¹³ [Law of the People's Republic of China on the Protection of Women's Rights and Interests](#)

¹⁴ [Special Provisions on Labor Protection for Women Workers](#)

¹⁵ https://www.gzzx.gov.cn/rdzt/kjyqgzzzxd_1/fyygflfg/202106/P020210615548394847969.pdf

		prohibits forced labor. The project owner obeys and will always obey the law.
Child labor	No risk identified	The Labor Law of the People's Republic of China, Law of the People's Republic of China on the Protection of Minors ¹⁶ and Prohibition of Child Labor Regulations ¹⁷ prohibit employers from hiring minors under the age of 16. The project owner obeys and will always obey the law.
Human trafficking	No risk identified	The Criminal Law of the People's Republic of China expressly prohibits trafficking in persons. The project owner obeys and will always obey the law, and there is no human trafficking.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	During monitoring period of the project, project owner keeps communicating with local stakeholders to recognizes, respects, and promotes the protection of the rights of IPs, LCs, and customary rights holders in line with applicable international human rights law, and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples. In China, human rights protection is explicitly stated in the Constitution¹⁸, which shares the

¹⁶ [Law of the People's Republic of China on the Protection of Minors](#)

¹⁷ [Prohibition of Child Labor Regulations](#)

¹⁸ [The Constitution of the People's Republic of China](#)

	same values as international human rights protection ¹⁹ . In addition, China has established a sound labor arbitration and litigation mechanism to fully protect the rights and interests of workers. If there is any violation, relevant personnel will be punished by local laws and regulations.
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2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	The project contributes to preserving and encouraging employees to protect cultural heritage as part of project activities.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project has reached an agreement with Liyang coal mine on the supply and usage of CMM. According to the agreement, the project has no legal or customary tenure/access rights to territories, property, and resources, including collective and/or conflicting rights, held by stakeholders.

2.3.5 Benefit Sharing

As the project activity doesn't impact on the property rights as described in Section 2.3.4 above, thus the following information is not applicable.

Summary of the benefit sharing plan	Not applicable
Benefit sharing during the monitoring period	Not applicable

¹⁹ China Respects and Guarantees Human Rights China National People's Congress

2.4 Ecosystem Health

Risk identified		Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	The environmental impacts of the Project and in operation period identified in the Environmental Impact Assessment (EIA) show the irrelevance.
Soil degradation and soil erosion	No risk identified	According to EIA of the project, it does not involve impact on soil degradation and soil erosion.
Water consumption and stress	No risk identified	According to EIA of the project, it does not involve impact on water consumption and stress.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	This project is based on a coal mine, where no habitats for rare, threatened, and endangered species get involved or influenced.
Areas needed for habitat connectivity	This project is based on a coal mine, where no areas for habitat connectivity get involved or influenced.

Risks identified		Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	This project is based on a coal mine, where no habitats for rare, threatened, and endangered species get involved or influenced.
Areas for habitat connectivity	No risk identified	This project is based on a coal mine, where no areas for habitat connectivity get involved or influenced.

2.4.2 Introduction of species

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

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

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	N/A	N/A

2.4.3 Ecosystem conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	Not applicable. The project uses CMM to supply clean electricity and has no impact on the ecosystem.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project started construction on 1-March-2021 and operated on 1-March-2022. It is constructed in phases. The construction of 20 sets of CMM gas generators with each capacity of 0.6MW has already been completed during the first phase, resulting in a total installed capacity of 12MW (20*0.6MW) to utilize low concentration CMM for power generation. The remaining 3MW (4*0.5MW+1MW) will depend on the availability of CMM volume and concentration. However, this is contingent upon the volume and concentration of CMM available at that time From 1-March-2022 to 31-December-2024. The total electricity supply to NCPG is 118,856.36 MWh and the total amount of methane destructured is 26,787.68 tCH₄. The total achieved emission reductions are 757,901 tCO_{2e}.

The gas generators cannot be ignited when the CMM concentration falls below 8%. In addition, at times of low concentration of CMM or fluctuation of CMM volume, some of the gas generators only run at partial loads, essentially reducing the effective operation hour assuming full load.

The technical process of the Project is shown in Figure 3-1. Low concentration CMM is delivered through methane extraction pumps to the pre-treatment system for safety treatment and then goes into the gas generators for power generation. Then, the waste heat from gas generators is recovered by the waste heat boilers, and saturated steam from waste heat boilers is supplied to

the steam turbine generator to produce electricity. Surplus saturated steam is supplied to the coal mine to replace part of the heat that would be generated by the gas-fired boilers. The generated electricity is supplied to the NCPG. To be conservative, heat supply is disregarded in the calculation, claiming no emission reduction.

The Project uses domestic gas generators. After site survey and taking advice from professional experts, the preparation organization of Feasibility Study Report (FSR) determined the annual operating hours to be 5,500 hours in the FSR, and thus the plant load factor (PLF) is 0.6279²⁰.

The equipment employed in the Project is all produced domestically without technology transfer. As shown in Figure 3-1, the Project installs gas analyser, flow meters, thermometers and manometers to respectively monitor the methane concentration and CMM volume sent to the CMM power plants. Bidirectional meters are installed to monitor the electricity export and import.

As shown in Figure 3-1, one gas analyser, flow meters, thermometers and manometers were installed to monitor the methane concentration and CMM volume sent to the CMM power plants. The bidirectional meter was installed to monitor the electricity export and import.

The emission reductions of the Project come from two sources: 1) CH₄ emission as a result of venting gas that will be captured and destroyed in the Project scenario; 2) CO₂ emissions from the production of the equivalent amount of electricity replaced by the Project that would otherwise have been generated by power plants dominated by fossil fuel fired.

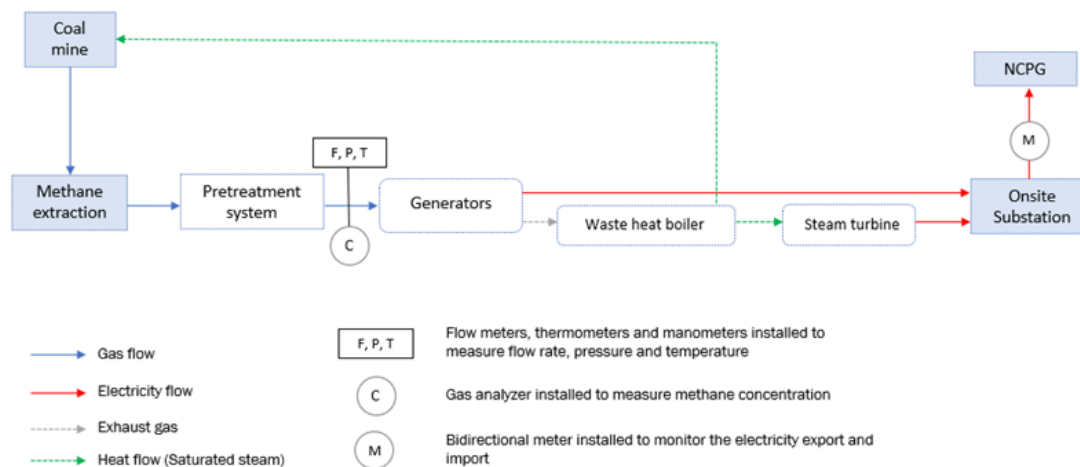


Figure 3-1 Project Process

Table 3-1 Gas Generator Specifications

Type	600GFZ1-RWD-TEM2-4
Quantity	20

²⁰ 0.6279=5,500 hours/8,760 hours

Rated power (kW)	600
Rated speed (r/min)	1000
Power factor	0.8
Lifetime (year)	10

During the operation of the project, the extracted methane from coal mine is recovered by the project and the remaining share of the methane was still vented into the atmosphere for safety reason in line with the methodology. There is no overlap or other methane utilization issue happened to the coal mine during this monitoring period.

The project was in normal operation during the indicated monitoring period, and no event or situation may affect the applicability of the methodology occurred during the period.

3.2 Deviations

3.2.1 Methodology Deviations

No deviations from the methodology.

3.2.2 Project Description Deviations

No project description deviations applied for this project.

3.3 Grouped Projects

The project is not a grouped project, not applicable.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	MT _{BL,s,i,y}
Data unit	tCH ₄

Description	Methane from source s that would have been captured and destroyed by use i in the baseline scenario in the year y
Source of data	Data provided by the project owner
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	In the baseline scenario, there is no CMM captured and destroyed, thus $MT_{BL,s,i,y}$ is 0

Data / Parameter	CEF_{CH_4}
Data unit	tCO ₂ e/ tCH ₄
Description	Carbon emission factor for combusted methane
Source of data	ACM0008 (Version 8.0)
Value applied	2.75
Justification of choice of data or description of measurement methods and procedures applied	ACM0008 (Version 8.0) default value
Purpose of Data	Calculation of project emissions
Comments	$44/16 = 2.75\text{tCO}_2\text{e/tCH}_4$

Data / Parameter	D_{CH_4}
Data unit	kg/m ³
Description	Density of methane under normal conditions of temperature and pressure
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.67

Justification of choice of data or description of measurement methods and procedures applied	IPCC reference
Purpose of Data	Used to calculate the methane from source s captured and destroyed by the project activity in mass unit. $MT_{PJ,s,i,y}$ ($MM_{ELEC,y}$) is monitored by flow meter in volume unit and converted to mass unit with the parameter of D_{CH_4}
Comments	Normal conditions of temperature and pressure are defined as 1 atm and 293.15K.

Data / Parameter	$EF_{k,y}$ ($EF_{grid,CM,y}$)
Data unit	tCO ₂ /MWh
Description	Combined margin emission factor for the grid in year y
Source of data	"2021 Baseline Emission Factors for Regional Power Grids in China" published by DNA of China
Value applied	0.7207
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 07.0) from UNFCCC.
Purpose of Data	Calculation of baseline emissions.
Comments	According to section 5.1. the ex-ante option is selected to calculate $EF_{grid, OM,y}$ and $EF_{grid, BM,y}$ and fixed in the crediting period, thus the $EF_{k,y}$ is fixed during the crediting period

4.2 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 from the monitored data

Description of measurement methods and procedures to be applied	$MT_{PJ,s,i,y}$ is calculated by the gas flow rate, pressure, temperature and CH ₄ concentration of CMM, which are continuously measured by flow meters (with accuracy class of 2.5), thermometers (with accuracy class of 0.5), manometers (with accuracy class of 0.5) and gas analyzers (with accuracy class of 3%FS). All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuous monitoring, daily recording and monthly aggregating
Value monitored	26,787.68

Monitoring equipment

Flow meters, manometers and thermometers were installed to continuously measure the gas flow (in volume), pressure and temperature. Gas analyzers were installed to continuously measure the methane concentration in the CMM. There are three pipelines connecting the treatment system to the generators, with a set of monitoring meters installed on each of them, i.e., one thermometer, one manometer, one gas analyzer and one flow meter, Therefore, there are three flow meters, three manometers, three gas analyzers and three thermometers in total.

Equipment	Flow Meter F1
Type	TK2200G2A5HDNT02B3K0EX
SN	1385L163648521
Accuracy	2.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 15-Feb-2023; 05-Feb-2024
Validity	18-Feb-2023 14-Feb-2024 04-Feb-2025

Equipment	Flow Meter F2
Type	TK2200G2A5HDNT02B3K0EX
SN	1905L169640520
Accuracy	2.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 15-Feb-2023; 05-Feb-2024
Validity	18-Feb-2023; 14-Feb-2024; 04-Feb-2025

Equipment	Flow Meter F3
Type	TK2200G3A5HDNT03B3K0EX
SN	2005L127860066
Accuracy	2.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 15-Feb-2023; 05-Feb-2024
Validity	18-Feb-2023; 14-Feb-2024; 04-Feb-2025

Equipment	Thermometer T1
Type	ZDTC9105BA1804H/G1PGAB2260-YL
SN	Y19062001
Accuracy	0.5
Calibration frequency	Annually
Calibration date	24-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	23-Feb-2023; 08-Feb-2024; 01-Feb-2025

Equipment	Thermometer T2
Type	ZDTC9105BA1804H/G1PGAB2260-YL
SN	Y19062002
Accuracy	0.5
Calibration frequency	Annually
Calibration date	24-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	23-Feb-2023;

	08-Feb-2024; 01-Feb-2025
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Equipment	Thermometer T3
Type	SBWA202M/TILT-YL
SN	ZY2020051403
Accuracy	0.5
Calibration frequency	Annually
Calibration date	24-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	23-Feb-2023; 08-Feb-2024; 01-Feb-2025

Equipment	Manometer M1
Type	MC20B
SN	H96A4603
Accuracy	0.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	18-Feb-2023; 08-Feb-2024; 01-Feb-2025

Equipment	Manometer M2
Type	LPT-800D5XLT-YL
SN	20051403
Accuracy	0.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	18-Feb-2023; 08-Feb-2024;

	01-Feb-2025
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Equipment	Manometer M3
Type	MC20B
SN	H96A4602
Accuracy	0.5
Calibration frequency	Annually
Calibration date	19-Feb-2022; 09-Feb-2023; 02-Feb-2024
Validity	18-Feb-2023; 08-Feb-2024; 01-Feb-2025

Equipment	Gas analyzer G1
Type	JSA5-CH4-A
SN	2019A5G05CH4-1
Accuracy	3%FS
Calibration frequency	Annually
Calibration date	27-Feb-2022; 16-Feb-2023; 01-Feb-2024
Validity	26-Feb-2023; 15-Feb-2024; 31-Jan-2025

Equipment	Gas analyzer G1'
Type	JSA5-CH4-A
SN	2024A5F07CH4
Accuracy	3%FS
Calibration frequency	Annually
Calibration date	29-Mar-2024
Validity	28-Mar-2025
Note	The original gas analyzer (2019A5G05CH4-1) was replaced by this new one on March 31, 2024. No data was lost because of

	the replacement of the analyzer, since the project was taken offline due to gas-supply fluctuations. Consequently, this downtime had no impact on the emission-reduction calculations.
Equipment	Gas analyzer G2
Type	JSA5-CH4-A
SN	2020A5G10CH4
Accuracy	3%FS
Calibration frequency	Annually
Calibration date	27-Feb-2022; 16-Feb-2023; 01-Feb-2024
Validity	26-Feb-2023; 15-Feb-2024; 31-Jan-2025

Equipment	Gas analyzer G3
Type	JSA5-CH4-A
SN	2020A5E26CH4
Accuracy	3%FS
Calibration frequency	Annually
Calibration date	27-Feb-2022; 16-Feb-2023; 01-Feb-2024
Validity	26-Feb-2023; 15-Feb-2024; 31-Jan-2025

QA/QC procedures to be applied	The monitored Methane flow is cross-checked each month against the CMM transaction notes issued by the coal mine and found consistent. Flow meters, manometers, thermometers, and gas analyzers are calibrated annually in compliance with Industry standard Vortex Flow Meter (JJG1029-2007 ²¹), Pressure Transmitters (JJG 882-2019), Calibration Specification of the Temperature Transmitter (JJF1183-2007 ²²) and Non-dispersive Infrared Methane Transmitters for Coal Mine (JJG 693-2011 ²³) respectively. The accuracy of the equipment also meets the requirements of relevant legal regulations. All electronic data and paper documents must be archived and kept for at least two years after the end of the project crediting period.
Purpose of data	Calculation of baseline emissions.
Calculation method	$MT_{PJ,s,i,y}$ is monitored by flow meters in volume unit and converted to mass unit with the parameter of D_{CH_4} .
Comments	Flow meters, manometers, thermometers record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure (defined as 1 atm, 293.15K) is 0.67kg/m ³ (2006 IPCC).

Data / Parameter	$MM_{ELEC,y}$
Data unit	t CH ₄
Description	Methane measured sent to use of power generation in year y
Source of data	Calculated from the monitored data
Description of measurement methods and procedures to be applied	$MM_{ELEC,y}$ (same with $MT_{PJ,s,i,y}$) is calculated by the gas flow rate, pressure, temperature and CH ₄ concentration of CMM, which are continuously measured by flow meters, manometers,

²¹<https://file.yizimg.com/382859/%E6%B6%A1%E8%A1%97%E6%B5%81%E9%87%8F%E8%AE%A1%E6%A3%80%E5%AE%9A%E8%A7%84%E7%A8%8B.PDF>

²² <https://www.doc88.com/p-1354840174496.html>

²³ <https://www.doc88.com/p-68573473159287.html>

	thermometers and the gas analyzers respectively. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuous monitoring, daily recording and monthly aggregating
Value monitored	26,787.68
Monitoring equipment	Flow meters, manometers and thermometers were installed to continuously measure the gas flow (in volume), pressure and temperature. The gas analyzer was installed to continuously measure the methane concentration in the CMM.
QA/QC procedures to be applied	The monitored Methane flow is cross-checked each month against the CMM transaction notes issued by the coal mine and found consistent. Flow meters, manometers, thermometers, and gas analyzers are calibrated annually in compliance with Industry standard Vortex Flow Meter (JJG1029-2007), Pressure Transmitters (JJG 882-2019), Calibration Specification of the Temperature Transmitter (JJF1183-2007) and Non-dispersive Infrared Methane Transmitters for Coal Mine (JJG 693-2011 ²⁴) respectively. The accuracy of the equipment also meets the requirements of relevant legal regulations. All electronic data and paper documents will be archived and kept for at least two years after the end of the project crediting period.
Purpose of data	Calculation of project emissions.
Calculation method	$MM_{ELEC,y}$ is monitored by flow meters in volume unit and converted to mass unit with the parameter of D_{CH_4} .
Comments	Flow meters, manometers, thermometers record gas volumes, pressure and temperature respectively. Density of methane under normal conditions of temperature and pressure (defined as 1 atm, 293.15K) is 0.67kg/m ³ (2006 IPCC).
Data / Parameter	GWP_{CH_4}

²⁴ <https://www.doc88.com/p-68573473159287.html>

Data unit	tCO ₂ e/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	-
Value monitored	28
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions and project emissions.
Calculation method	-
Comments	-

Data / Parameter	EG _{use,k,y} (EG _{PJ,grid,y})
Data unit	MWh
Description	Energy of type k displaced by the project activity in year y
Source of data	Monitoring data provided by the project owner
Description of measurement methods and procedures to be applied	Bidirectional electricity meter is applied to measure the amount of electricity exported by the project activity. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuous monitoring, daily recording and monthly aggregating
Value monitored	118,856.36

Monitoring equipment	One bidirectional electricity meter in total is installed at the onsite substation to monitor the total electricity delivered to the grid and the electricity imported from the grid.	
	Equipment	Bidirectional electricity meter
	Type	DSZ535
	SN	190409018970
	Accuracy	0.2S
	Calibration frequency	Annually
	Calibration date	19-Feb-2022; 12-Feb-2023; 02-Feb-2024
	Validity	18-Feb-2023; 11-Feb-2024; 01-Feb-2025
QA/QC procedures to be applied	The data is cross-checked continuously with Electricity Transaction Notes (ETN) throughout the monitoring period. In cases of discrepancy between the two, the calculation of emission reductions shall be based on the data provided by the ETN. The electricity meter is calibrated annually in compliance with Industry standard (JJG596-2012 ²⁵). All electronic data and paper documents will be archived and kept for at least two years after the end of the project crediting period.	
Purpose of data	Calculation of baseline 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	

²⁵<https://www.doc88.com/p-4714835396286.html>

Source of data	Monitoring data provided by the project owner
Description of measurement methods and procedures to be applied	A bidirectional electricity meter is applied to measure the amount of electricity imported to the project activity. All electronic data and paper documents will be archived for two years following the end of the crediting period.
Frequency of monitoring/recording	Continuous monitoring, daily recording, and monthly aggregating
Value monitored	876.40
Monitoring equipment	One bidirectional electricity meter in total is installed at the onsite substation to monitor the total electricity delivered to the grid and the electricity imported from the grid.
QA/QC procedures to be applied	The data is cross-checked continuously with Electricity Transaction Note (ETN) throughout the monitoring period. In cases of discrepancy between the two, the calculation of emission reductions shall be based on the data provided by the ETN. The electricity meter is calibrated annually in compliance with Industry standard. The accuracy of the electricity meters also meets the requirements of relevant legal regulations. All electronic data and paper documents will be archived and kept for at least two years after the end of the project crediting period.
Purpose of data	Calculation of project emissions.
Calculation method	-
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	CDM Methodological tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (v03.0)
Description of measurement methods and procedures to be applied	CDM Methodological tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (v03.0) default value
Frequency of monitoring/recording	-
Value monitored	20%
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
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	$Eff_{i,y}(Eff_{ELEC,y})$
Data unit	%
Description	Efficiency of methane destruction in use i (for the project, i represents power generation)
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Description of measurement methods and procedures to be applied	IPCC reference
Frequency of monitoring/recording	-

Value monitored	99.5%
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions.
Calculation method	-
Comments	The parameter will be updated according to IPCC.

4.3 Monitoring Plan

The monitoring plan presented in this monitoring report assures that real, measurable, long-term GHG emission reductions can be monitored, recorded and reported. It is a crucial procedure to identify the final VCU 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:

- The project monitoring diagram is displayed as Figure 4-1
- Data and parameters to be monitored are listed below in Figure 4-1, which shows the positions of the monitoring instruments:

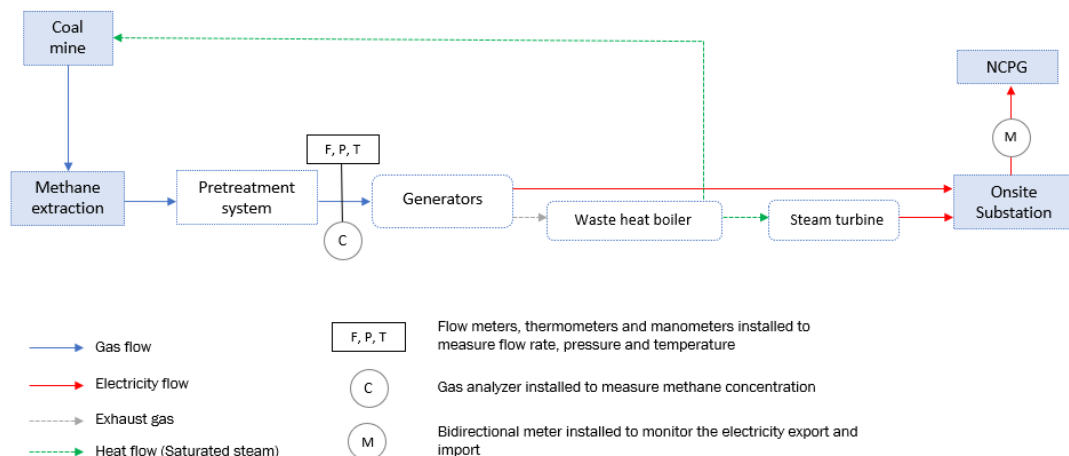


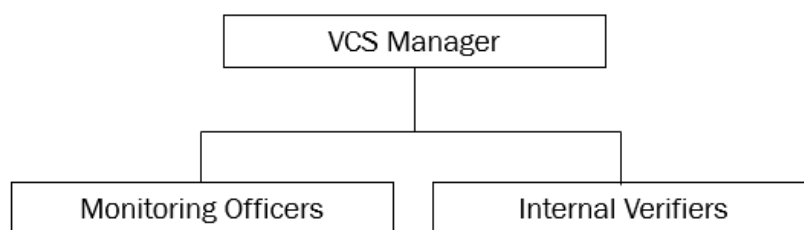
Figure 4-1 Project monitoring diagram

Table 4-1 Corresponding parameters monitored

Position	Parameter Monitored	Description
CMM Inflow Monitoring: Flow meters, manometers, thermometers and gas analyzers are installed at the outlet of the pretreatment system.	$MT_{PJ,s,i,y}$ and $MM_{ELEC,y}$	Methane concentration, gas flow rate, pressure and temperature are monitored on-site and used to calculate methane from source s captured and destroyed by use of power generation and methane measured sent to use of power generation.
Electricity Monitoring: Installed at the onsite substation to monitor the total electricity delivered to the grid and the electricity imported from the grid.	$EG_{use,k,y}$ ($EG_{PJ,grid,y}$) and $EC_{PJ,j,y}$	Electricity generation by the project and electricity consumption for the project activity are continuously monitored.

C. 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 are 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 6-1 shows the operation and management structure of the Project.


Figure 4-1 Operation and management structure of the project

D. Data collection

Monitoring officers are responsible for data collection. The designated team 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.

E. 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 verification, the project owner will preserve the calibration records, along with the data files of project monitoring.

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

The installation of the electricity metering equipment will fulfil the requirements of “DL/T448-2016 Technical Administrative Code of Electric Energy Metering”²⁶. The installation of flow meter and gas analyzer will fulfil the national standard (JJG1029-2007²⁷ and JJG 693-2011²⁸). All the meters will be checked and maintained periodically.

F. Emergency procedure

In case of any failure or malfunction of any monitoring instrument, the project participant and the equipment suppliers will repair or displace it as soon as possible, and the emission reductions achieved during the troubleshooting period will be calculated conservatively.

During the reported validation period, no emergency occurred, and no event, which might impact the monitoring plan, the applied methodology or the calculation of emission reductions, occurred.

G. Data file management

All monitoring data will be electronically filed by the end of each month. 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.

²⁶ <https://www.docin.com/p-1944975618.html>

²⁷

<https://file.yizimg.com/382859/%E6%B6%A1%E8%A1%97%E6%B5%81%E9%87%8F%E8%AE%A1%E6%A3%80%E5%AE%9A%E8%A7%84%E7%A8%8B.PDF>

²⁸ <https://www.doc88.com/p-68573473159287.html>

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

a). Methane destruction in the baseline

$$BE_{MD,y} = 0$$

b). Methane released into the atmosphere

Density of methane under normal conditions of temperature and pressure (defined as 1 atm, 293.15K) is 0.67kg/m³ (2006 IPCC).

Period	MM_{ELEC}	Methane density (ρ)	$MM_{ELEC}(\text{tCH}_4) = MM_{ELEC}(\text{m}^3) \cdot \rho$
	(m ³)	(tCH ₄ / m ³)	(tCH ₄)
01-Mar-2022 to 31-Dec-2022	19,764,324.95	0.00067	13,242.10
01-Jan-2023 to 31-Dec-2023	7,495,710.43	0.00067	5,022.13
01-Jan-2024 to 31-Dec-2024	12,721,571.02	0.00067	8,523.45
Total	39,981,606.40		26,787.68

GWP_{CH_4} is IPCC Fifth Assessment Report (AR5) default value, which equals to 28.

Period	$MT_{PJ,s,j,y}$	GWP_{CH_4}	$BE_{MR} = MT_{PJ,s,j,y} * GWP_{CH_4}$
	(tCH ₄)	(tCO ₂ e/tCH ₄)	(tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	13,242.10	28	370,778

01-Jan-2023 to 31-Dec-2023	5,022.13	28	140,619
01-Jan-2024 to 31-Dec-2024	8,523.45	28	238,656
Total	26,787.68		750,054

c). Emissions from power generation by project

Period	$EG_{use,k,y}$	$EF_{k,y}$	$BE_{Use,y}$ $= (EG_{use,k,y} \times EF_{k,y})$
	(MWh)	(tCO ₂ e/MWh)	(tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	58,592.24	0.7207	42,227
01-Jan-2023 to 31-Dec-2023	22,315.44	0.7207	16,082
01-Jan-2024 to 31-Dec-2024	37,948.68	0.7207	27,349
Total	118,856.36		85,659

Total baseline emissions

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y}$$

Period	$BE_{MD,y}$	$BE_{MR,y}$	$BE_{Use,y}$	BE_y
	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	0	370,778	42,227	413,005
01-Jan-2023 to 31-Dec-2023	0	140,619	16,082	156,701

01-Jan-2024 to 31-Dec-2024	0	238,656	27,349	266,005
Total	0	750,054	85,659	835,711

Detailed monthly data and calculation process are shown in the ER spreadsheet and have been provided to VVB for verification.

5.2 Project Emissions

a). Emissions from the energy use to capture and use methane

$$PE_{ME,y} = EC_{PJ,j,y} \times Eff_{grid,CM,y} \times (1 + TDL_{j,y})$$

Period	$EC_{PJ,j,y}$	$Eff_{grid,CM,y}$	$TDL_{j,y}$	$PE_{ME,y}$ = $EC_{PJ,j,y}$ $\times Eff_{grid,CM,y}$ $\times (1 + TDL_{j,y})$
	(MWh)	(tCO ₂ e/MWh)	(%)	(tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	6.44	0.7207	20	6
01-Jan-2023 to 31-Dec-2023	462.00	0.7207	20	400
01-Jan-2024 to 31-Dec-2024	407.96	0.7207	20	353
Total	876.40			758

b). Emissions from destruction of captured methane through production of various energy types and/or flaring and/or flameless oxidation

As mentioned above, since emission reductions will not be claimed for heat supply and the Project does not involve emission reductions from supply of vehicle fuels. The Project only involves methane destroyed through power generation.

Density of methane under normal conditions of temperature and pressure (defined as 1 atm, 293.15K) is 0.67kg/m³ (2006 IPCC).

$$PE_{MD,y} = MM_{ELEC,y} \times Eff_{ELEC,y} \times CEF_{CH_4}$$

Period	MM_{ELEC}	Methane density (ρ)	$MM_{ELEC}(tCH_4) = MM_{ELEC}(m^3) \times \rho$
	(m ³)	(tCH ₄ /m ³)	(tCH ₄)
01-Mar-2022 to 31-Dec-2022	19,764,324.95	0.00067	13,242.10
01-Jan-2023 to 31-Dec-2023	7,495,710.43	0.00067	5,022.13
01-Jan-2024 to 31-Dec-2024	12,721,571.02	0.00067	8,523.45
Total	39,981,606.40		26,787.68

According to ACM0008 (Version 8.0), the Carbon emission factor for combusted methane $CEF_{CH_4} = 2.75$

Period	MM_{ELEC}	$Eff_{ELEC,y}$	$MD_{ELEC} = MM_{ELEC} \times Eff_{ELEC}$	CEF_{CH_4}	$PE_{MD} = MD_{ELEC} \times CEF_{CH_4}$
	(tCH ₄)	(%)	(tCH ₄)	(tCO ₂ /tCH ₄)	(tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	13,242.10	0.995	13,175.89	2.75	36,234
01-Jan-2023 to 31-Dec-2023	5,022.13	0.995	4,997.02	2.75	13,742

01-Jan-2024 to 31-Dec- 2024	8,523.45	0.995	8,480.84	2.75	23,323
Total	26,787.68		26,653.74		73,298

c). Emissions from the un-combusted methane

$$PE_{UM,y} = GWP_{CH_4} \times MM_{ELEC,y} \times (1 - Eff_{ELEC,y})$$

Not all the methane sent to the flare, or to be used to generate power and heat will be combusted, so a small amount will be released to the atmosphere.

Period	MM_{ELEC}	$Eff_{ELEC,y}$	GWP_{CH_4}	$PE_{UM,y}$ $= GWP_{CH_4}$ $\times MM_{ELEC,y}$ $\times (1 - Eff_{ELEC,y})$
	(tCH ₄)	(%)	(tCO ₂ e/tCH ₄)	(tCO ₂ e)
01-Mar-2022 to 31-Dec- 2022	13,242.10	0.995	28	1,854
01-Jan-2023 to 31-Dec- 2023	5,022.13	0.995	28	704
01-Jan-2024 to 31-Dec-2024	8,523.45	0.995	28	1,194
Total	26,787.68			3,751

Total project emissions :

$$PE_y = PE_{ME,y} + PE_{MD,y} + PE_{UM,y}$$

Period	$PE_{ME,y}$	$PE_{MD,y}$	$PE_{UM,y}$	PE_y
	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)

01-Mar-2022 to 31-Dec-2022	6	36,234	1,854	38,094
01-Jan-2023 to 31-Dec-2023	400	13,742	704	14,846
01-Jan-2024 to 31-Dec-2024	353	23,323	1,194	24,870
Total	758	73,298	3,751	77,810

5.3 Leakage Emissions

Leakage may occur if the Project activity prevents methane from being used to meet baseline thermal energy demand, whether because 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 GHG Emission Reductions and Carbon Dioxide Removals

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01-Mar-2022 to 31-Dec-2022	413,005	38,094	0	374,911	N/A	374,911
01-Jan-2023 to 31-Dec-2023	156,701	14,846	0	141,855	N/A	141,855
01-Jan-2024 to 31-Dec-2024	266,005	24,870	0	241,135	N/A	241,135
Total	835,711	77,810	0	757,901	N/A	757,901

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Mar-2022 to 31-Dec-2022	324,304.41 ²⁹	374,911	15.60%	The annual electricity exported by the Project is determined based on 1) generator performance and 2) availability and stability of CMM supply.
01-Jan-2023 to 31-Dec-2023	388,102.00	141,855	-63.45%	
01-Jan-2024 to 31-Dec-2024	388,102.00	241,135	-37.87%	
Total	1,100,508.41	757,901	-31.13%	The difference comes mainly from 2) for this project. The gas generators cannot be ignited when the CMM concentration falls below 8%. At times of low concentration of CMM or fluctuation of CMM volume, some of the gas generators will only run at partial loads, essentially reducing the effective operation hour assuming full load. The shortfalls in electricity generation and gas flows compared to FSR's expectations contributed to the difference in emissions reductions compared to FSR's expectations. Consequently, considering the gas volume stability, gas concentration and hours of operation, the realized

²⁹ 388,102*305/365=324,304.41

GHG emission reductions are 31.13% lower than the estimation in FSR.

APPENDIX 1: <SUPPORTING EVIDENCE FOR SDGS>

Evidence for SDG 13: From project operation date onwards, emission reduction in this monitoring period have been listed in the table below.

Monitoring Period	ERy
01-Mar-2022 to 31-Dec-2022	374,911
01-Jan-2023 to 31-Dec-2023	141,855
01-Jan-2024 to 31-Dec-2024	241,135
Total	757,901

Evidence for self-defined indicators “Contribution to clean energy generation” and “Contribution to Local Employment: Competitive Payroll and Job Creation”. The electricity transaction note and employee payroll of the project have been submitted in a separate document to VVB due to confidentiality requirement of the project proponent.