



**Verified Carbon
Standard**

SHANXI XIYANG CMM POWER GENERATION PROJECT



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Monitoring period	01-December-2022 to 31-August-2024
Crediting period	01-December-2022 to 30-November-2032
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Shanxi Xiyang CMM Power Generation Project (hereinafter referred to as the Project) will utilize the low concentration coal mine methane (CMM) from Xiyang Fenghui coal mine for power generation to supply electricity to the coal mine where the Project is located and to North China Power Grid(NCPG) if there is any electricity surplus. The Project is located in Dazhai Town, Xiyang County, Jinzhong City, Shanxi Province, P.R.China. The Project Owner is Shanxi Xiyang Fenghui coal industry Co., Ltd. Power Plant(hereinafter referred to as the PP).

Prior to the implementation of the project, Xiyang Fenghui coal mine was equipped with CMM extraction facilities and all extracted CMM was vented into the atmosphere directly; the electricity consumed at coal mines was imported from North China Power Grid (NCPG); the heat was provided by waste coal boilers. Baseline scenario is the same as the scenario existing prior to the implementation of the project activity..

The mining capacity of the Xiyang Fenghui coal mine is 1.2 million tonnes per year. The project activity utilizes low-concentration CMM with a concentration range between 15% to 26%.

The purpose of the project is to utilize the extracted CMM with low concentration methane concentration to produce electricity. No coal bed methane (CBM) or ventilation air methane (VAM) utilization is involved. Twelve sets of CMM power generators will be installed with a total installed capacity of 24MW (12*2MW), destroying 42.14 million m³ of methane annually. The expected annual exported electricity will be 163,990 MWh, which will be supplied to the coal mine first through the electricity distribution network in Xiyang Fenghui coal mine area, and then to North China Power Grid(NCPG) if there is any electricity surplus, replacing the electricity that would otherwise have been purchased from the NCPG and displace part of the electricity generated by NCPG dominated by fossil fuel-fired power plants. The waste heat from the generators will be recovered by waste heat boilers to provide free hot water to the coal mines, which was provided by waste coal fired boilers before the implementation of the Project. However, to be conservative, emission reductions will not be claimed for this part.

The project started construction on 23-November-2021 and was put into operation on 01-December-2022. The emissions reduction of the Project comes from two sources: 1) Methane (CH₄) emissions as a result 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 purchased from the NCPG. It is estimated that in the 10 years crediting period of the project (from 01-December-2022 to 30-November-2032), the expected average annual GHG emission reduction will be 813,242 tCO₂e, with the total emission reduction of 8,132,420 tCO₂e.

The Project contribute to sustainable development in the following ways:

- Achieving significant GHG emission reductions and other air pollutant reductions by methane destruction;
- Displacing part of the grid electricity mainly generated by fossil fuel combustion, thus reducing the emission of CO₂ and other air pollutants;
- Creating new job opportunities.

During this monitoring period from 01-December-2022 to 31-August-2024, the actual total installed capacity of the project is 24MW (12*2,000kW), the project has destroyed 37,989.10tCH₄ and exported electricity 184,341.61 MWh, achieving emission reductions of 1,071,207 tCO₂e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	(25-September-2024 to 26-September-2024) ¹	VCS	CTI Certification Co., Ltd	N/A
Verification	(01-December-2022 to 31-August-2024)	VCS	CTI Certification Co., Ltd	1.75 ²
Total	(01-December-2022 to 31-August-2024)	VCS	CTI Certification Co., Ltd	1.75

1.3 Sectoral Scope and Project Type

Complete the table below with information relevant for non-AFOLU projects:

Sectoral scope³	Sectoral Scope 01: Energy industries (renewable - / non-renewable sources) Sectoral Scope 08: Mining/mineral production
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¹ The validation is conducted in combination with the 1st verification. At the time of this PD & MR writing, the validation has not been completed yet, and the dates of the site visit are shown here.

² Calculated as follows: 640 days / 365 days = 1.75, as this monitoring period (01-December-2022 to 31-August-2024) covers 640 days.

³ 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>

Project activity type

Non-AFOLU project.
Non- grouped project

1.4 Project Eligibility

1.4.1 General eligibility

The scope of the VCS Program includes:

1) The seven Kyoto Protocol greenhouse gases: The emissions reduction of the project comes from two sources: 1) Methane (CH₄) emissions as a result 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 purchased from the NCPG and displace part of the electricity generated by NCPG if the electricity is surplus dominated by fossil fuel-fired power plants. Thus, the project applicable to this scope.

2) Ozone-depleting substances (ODS) : NA.

3) Project activities supported by a methodology approved under the VCS Program through the methodology development and review process: NA.

4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions) : The methodology ACM0008 (Version 08.0) of the project utilized is a methodology approved under CDM Program, that is a VCS approved GHG program.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the Jurisdictional and Nested REDD+ (JNR) Requirements: NA.

As per VCS Standard v4.7, Section 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". The project activity uses extracted CMM to generate electricity, which belongs to the project of immediate greenhouse gas destruction, which is apparently not a project that generates GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction. Therefore, the Project is not excluded under the scope of the VCS program.

According to VCS Standard 4.7, Non-AFOLU projects shall initiate the project pipeline listing process and complete validation within two years of the project start date. The project is a non AFOLU project, and the project has started on 01-December-2022, less than two years ago.

Furthermore, the project does not belong to the project activities excluded in Table 1 of VCS Standard 4.7. Therefore, the proposed project activity is eligible under the scope of the VCS program.

According to the section 3.1 of VCS Standard (Version 4.7), establishing a consistent and standardized certification process is critical to ensuring the integrity of VCS projects. Accordingly, certain high-level requirements must be met by all projects, as set out below:

3.1.1 Projects shall meet all applicable rules and requirements set out under the VCS Program, including this document. Projects shall be guided by the principles set out in Section 2.2.1.

The project meets all applicable rules and requirements set out under the VCS Program, including this document.

3.1.2 Projects shall apply methodologies eligible under the VCS Program. Methodologies shall be applied in full, including the full application of any tools or modules referred to by a methodology, noting the exception set out in Section 3.14.1. The list of methodologies and their validity periods is available on the Verra website.

The project applies the methodology ACM0008 (Version 08.0) along with tools or modules as applicable developed under the United Nations Clean Development Mechanism, which can be used for projects and programs registering with VCS as per requirements available on the Verra website.

3.1.3 Projects shall apply the latest version of the applicable methodology in all cases unless a grace period applies to the project as set out in 3.22 below. Projects shall update to the latest version of the methodology when reassessing the baseline or renewing a crediting period.

The project applies the methodology ACM0008 (Version 08.0) which is the latest version.

3.1.4 Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not the law is enforced.

According to the Environmental Impact Assessment (EIA) and Feasibility Study Report (FSR) of the project, the project complies with all Chinese relevant laws and regulations.

3.1.5 Where projects apply methodologies that permit the project proponent its own choice of model (see the VCS Program Definitions for the definition of model), the model shall meet the requirements set out in the VCS Methodology Requirements, and it shall be demonstrated at validation that the model is appropriate to the project circumstances (i.e., use of the model will lead to an appropriate quantification of GHG emission reductions or carbon dioxide removals).

Not applicable as there is no model needs to be chosen by the project proponent as per the applied methodology ACM0008 (Version 08.0).

3.1.6 Where projects apply methodologies that permit the project proponent to choose a third-party default factor or standard to ascertain GHG emission data and any supporting data for establishing baseline scenarios and demonstrating additionality, such default factor or standard shall meet the requirements set out in the VCS Methodology Requirements.

Applicable, GWP value in IPCC AR5 and default values of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories were used.

3.1.7 Where the rules and requirements under an approved GHG program conflict with the rules and requirements of the VCS Program, the rules and requirements of the VCS Program shall take precedence.

GWP value used in this project are based on the IPCC AR5, meets the rules and requirements of the VCS standard.

3.1.8 Where projects apply methodologies from approved GHG programs, they shall conform with any specified capacity limits (see the VCS Program Definitions for the definition of capacity limit) and any other relevant requirements set out with respect to the application of the methodology and/or tools referenced by the methodology under those programs.

Not applicable as there is no specified capacity limits or any other relevant requirements set out as per the applied methodology and tools.

3.1.9 Where Verra issues new VCS Program rules, the effective dates of these requirements are set out in Appendix3 Document History and Effective Dates or equivalent for other program documents, and are listed in a companion Summary of Effective Dates document which corresponds with each update.

The project has followed the latest requirements of Verra.

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 not transfer project nor CPAs seeking registration.

1.5 Project Design

- ☒ Single location or installation
- ☐ Multiple locations or project activity instances (but not a grouped project)
- ☐ Grouped project

Grouped Project Design

Not applicable as the project is not a grouped project.

1.6 Project Proponent

Organization name	Shanxi Xiyang Fenghui coal industry Co., Ltd. Power Plant
Contact person	Jianchun Qin
Title	General Manager
Address	Mahui Village, Dazhai Town, Xiyang County, Jinzhong City, Shanxi Province, China
Telephone	+86 035-44131669
Email	921899974@qq.com

1.7 Other Entities Involved in the Project

Organization name	Baineng New Energy (Shenzhen) Co.,Ltd.
Role in the project	Consultant
Contact person	Zexu Zhang
Title	Project Manager
Address	Room 302, No.2815 Longteng Avenue, Shanghai
Telephone	+86 13916000152
Email	project@cypressenergy.cn

1.8 Ownership

The project owner of the project is Shanxi Xiyang Fenghui coal industry Co., Ltd.Power Plant. The approval of Environmental Impact Assessment (EIA), Feasibility Study Report (FSR), and the business license of the project owner are evidence for legislative right. Besides, the Equipment purchasing contract, and the purchasing power agreement are the evidence for the ownership of the plant, equipment and power generating.

1.9 Project Start Date

Project start date	01-December-2022
Justification	As per 3.8 of VCS Standard (Version 4.7), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. The project activity is a non-AFOLU project and started operation on 01-December-2022, therefore, the project start date is 01- December-

2022.

1.10 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☒ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	01-December-2022 to 30-November-2032

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

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

- ☐ < 300,000 tCO₂e/year (project)
☒ ≥ 300,000 tCO₂e/year (large project)

Complete the table below for the first (if renewable) or fixed crediting period:

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO ₂ e)
01-Dec-2022 - 31-Dec-2022	69,070 ⁴
01-Jan-2023 - 31-Dec-2023	813,242
01-Jan-2024 - 31-Dec -2024	813,242
01-Jan-2025 - 31-Dec-2025	813,242
01-Jan-2026 - 31-Dec -2026	813,242
01-Jan-2027 - 31-Dec -2027	813,242
01-Jan-2028 - 31-Dec-2028	813,242
01-Jan-2029 - 31-Dec-2029	813,242

⁴ The estimated annual ERs are 813,242 tCO₂e, the period from 01-December-2022 to 31-December-2022 accounts for 31 days, thus the estimated ERs during 01-December-2022 to 31-December-2022 are calculated as 813,242 tCO₂e/yr × 31/365yr = 69,070 tCO₂e. Detailed calculation process is included in the ER spreadsheet.

01-Jan-2030 - 31-Dec-2030	813,242
01-Jan-2031 - 31-Dec-2031	813,242
01-Jan-2032 - 30-Nov-2032	744,172 ⁵
Total estimated ERRs during the first or fixed crediting period	8,132,420
Total number of years	10
Average annual ERRs	813,242

1.12 Description of the Project Activity

The working mining capacity of Xiyang Fenghui coal mine is 1.2 million tonnes per year, and went into operation in July-2012, which is designed to service life of 30 years.

Twelve sets of CMM power generators with total capacity of 24 MW will be installed to utilize CMM for power generation. The amount of pure methane destructed is estimated to be 42.14million Nm³ per year, and the total generated electricity is 172,800MWh per year, of which 5.1% is used in the power plant; the annual exported electricity is 163,990 MWh⁶

The project started construction on 23-November-2021 and was put into operation on 01-December-2022. 12 sets of CMM power generators with the total capacity of 24 MW has been installed, all the generators are operating normally and there is no emergency occurred. During this monitoring period from 01-December-2022 to 31-August-2024, the project has destroyed 37,989.10tCH₄ and exported electricity 184,341.61 MWh, achieving emission reductions of 1,071,207 tCO₂e.

The technical process of the Project is shown in Figure 1-1. The low concentration CMM is delivered through methane extraction pumps to pre-treatment system for safety treatment, and then goes into the gas engines for power generation. The generated electricity is for internal coal mine consumption and supplied to NCPG if there is any electricity surplus. The electricity will be imported from NCPG if the project is in regular maintenance or stop operation. The waste heat from the generators will be recovered by the waste heat boilers to provide hot water to coal mines.

⁵ The estimated annual ERs are 813,242 tCO₂e, the period from 1-January-2032 to 30-November-2032 accounts for 335 days, thus the estimated ERs during 1-January-2032 to 30-November-2032 are calculated as 813,242 tCO₂e/yr × 335/366yr = 744,361 tCO₂e. However, the estimated ERs are calculated conservatively as 813,242 tCO₂e-69,070 tCO₂e=744,172 tCO₂e. Detailed calculation process is included in the ER spreadsheet.

⁶ 163,990 MWh= 172,800 MWh *(1-5.1%)

The specifications of power generators are shown in Table 1-1. After site survey and taking advice from professional experts, the preparation organization of feasibility study report determined the annual operating hours to be 7,200 hours in the FSR, and thus the plant load factor (PLF) is 0.8219⁷.

As shown in Figure 1-1, the project installs gas analyzer and flow meters to respectively monitor the methane concentration and CMM volume sent to the CMM power plants. Electricity meters (M1) is installed to monitor the electricity exported to NCPG and the electricity imported from NCPG. Electricity meters (M2, M3) is installed to monitor the electricity exported to coal mines. Detailed monitoring information can be found in section 6.3.

The emission reduction of the project comes from two sources: 1) CH₄ emission as a result of venting gas that will be captured and destroyed in the project scenario; 2) CO₂ emission from the production of equivalent amount of electricity replaced by the Project that would otherwise be purchased from NCPG.

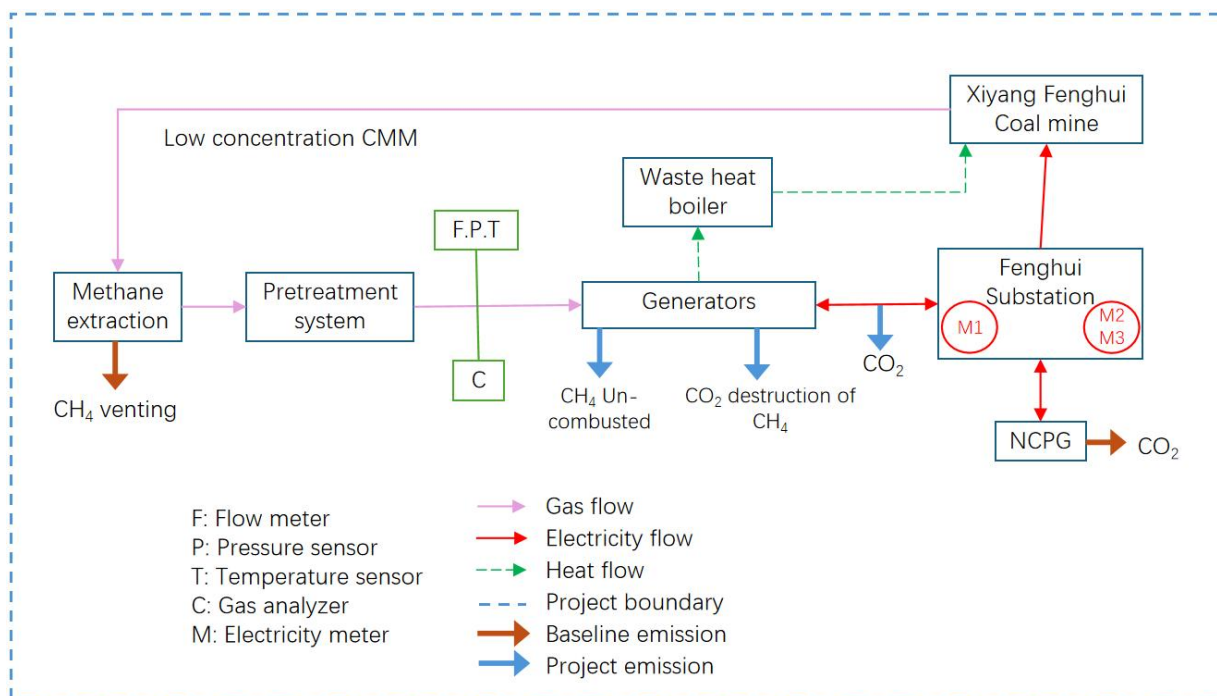


Figure 1-1 Project production processes

Table 1-1 Generator Specifications

Type	G3520C
Supplier	Caterpillar Inc.

⁷ 0.8219=7.200 hours/8,760 hours

Quantity	12
Rated power (kW)	2000
Rated current (A)	138
Rated voltage (V)	10500
Rotate speed (rpm)	1500
Frequency (Hz)	50
Power factor	0.8
Lifetime (year)	10

1.13 Project Location

The Project is located in Mahui Village, Dazhai Town, Xiyang County, Jinzhong City, Shanxi Province, People's Republic of China. The geographical coordinates for the project site are east longitude 113°37'23" ~113°40'43" and north latitude 37°30'53" ~37°32'34".

The geographic locations of the Project is shown in Figure 1-2.



Figure 1-2 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:

1) all the low concentration CMM extracted from the coal mines in the Project would be vented into the atmosphere; 2) the NCPG provided the equivalent amount of electricity produced by the project (as discussed above, the electricity generated by the Project will only replace electricity from NCPG) and 3) heat was provided by waste coal boilers (emission reductions due to heat replacement will not be claimed).

Baseline scenario is the same as the scenario existing prior to the implementation of the project activity.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

1. Renewable Energy Law of the People's Republic of China⁸;

According to the article 2 and 4 of this law, the State lists the development and utilization of nonfossil energy such as wind energy, solar energy, hydro energy, biomass energy, geothermal energy, and ocean energy as a priority area for energy development. CMM power generation belongs to non-fossil energy, so the utilization of CMM belongs to the field encouraged by the State. Thus, the project complies with this law.

2. Opinions of the General Office of the State Council on Further Accelerating the Extraction and Utilization of Coalbed Methane (Coal Mine Gas)⁹;

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 power generation. Thus, this project belongs to the field encouraged by the State and complies with this regulation.

3. Chinese National Coalmine Safety Regulation¹⁰;

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

⁸ http://www.gov.cn/ziliao/flfg/2005-06/21/content_8275.htm

⁹ http://www.gov.cn/zhengce/content/2013-09/18/content_2540.htm

¹⁰ <https://www.mem.gov.cn/fw/flfgbz/gz/>

4. Notice of the National Energy Administration on the issuance of the thirteenth Five-Year Plan for The Development and Utilization of Coalbed Methane (Coal Mine Gas)¹¹.

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 power generation, which complies with this Notice.

The project obtained the approval letters from governmental authorities: Shanxi Development and Reform Commission, Environmental Protection Bureau of Jinzhong City. 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

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

Has the project registered 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

¹¹ https://www.gov.cn/xinwen/2016-12/04/content_5142853.htm

The project is not included in any emissions trading program or any other mechanism that includes GHG allowance trading. The GHG emission reductions and removals generated by the project will not be used for compliance under such programs or mechanisms.

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading. In fact, China's national emissions trading scheme (ETS) only includes high-emission and energy intensive industries which are categorized as key emission enterprises by the provincial government¹², 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 list¹³ in public information. The project proponent and the project activity will not be included in the national ETS; no emission cap will be enforced on the project proponent or the project activity, nor can the project proponent participate in carbon transactions in the national ETS. Therefore, 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.

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

The project is a low concentration gas utilization project, which reduces GHG emission reductions by avoiding GHG emission of methane. Therefore, for the project activity, the emissions reductions are due to the changes of the way that the low concentration gas is utilized. Therefore, the project activities will not impact the emissions of goods and services in

¹² https://www.gov.cn/zhengce/zhengceku/202402/content_6930138.htm

¹³ <https://www.cets.org.cn/zdpfdwxgk/index.jhtml>

a supply chain, nor it will affect the indirect upstream and downstream GHG emissions in supply chain, and thus the Supply Chain (Scope 3) Emissions are not applicable.

1.18 Sustainable Development Contributions

1.18.1 Sustainable Development Contributions Activity Description

The project activity implemented by the project owner can contribute to sustainable development as defined by and tracked against the United Nations Sustainable Development Goals (SDGs).

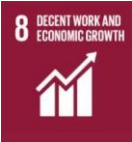
SDG 7 Affordable and Clean Energy: The project captures and utilizes coal mine gas for power generation and accordingly substitute equivalent electricity from thermal power. This contributes to achieve China's stated sustainable development priorities "By 2030, the proportion of non-fossil energy consumption will reach about 25%".

SDG 8 Decent Work and Economic Growth: 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, including for young people and persons with disabilities, and equal pay for work of equal value".

SDG 13 Climate Action: The project is to utilize the extracted CMM with low concentration methane concentration to produce electricity to avoid methane emissions. This contributes to achieve one of China's stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas".

SDG	Indicators	Chinese Sustainable Development Progress	Project activity contribution
	SDG7 Affordable and Clean Energy ¹⁴	By the end of 2015, China had fully solved the problem of providing electricity to all people without electricity, and reached the goal of the Sustainable Development Agenda 15 years ahead of schedule. From 2015 to 2020, the share of non-fossil energy increased from 14.5 % to 19.6%, while the share of raw coal decreased from 72.2 %to 67.6%.	The project captures and utilizes coal mine gas for power generation and accordingly substitute equivalent electricity from thermal power. This contributes to achieve China's stated sustainable development priorities "By 2030, the proportion of non-fossil energy consumption will reach about 25%".

¹⁴ <https://sdgs.un.org/goals/goal7>

	SDG 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"¹⁵.	China continuously improves the quality and efficiency of development. In-depth implementation of the innovation-driven development strategy, the rapid development of small and medium-sized enterprises. Adhering to the policy of giving priority to employment, the unemployment rate has remained at a low level. By coordinating epidemic prevention and control and economic and social development, it has become the only major economy to achieve positive growth in 2020 and has made positive contributions to the recovery of the global economy.	The project 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, including for young people and persons with disabilities, and equal pay for work of equal value".
	SDG 13 "Take urgent action to combat climate change and its impacts"¹⁶.	In 2020, China's energy consumption per unit of GDP was reduced by 24.4% compared with 2012; carbon dioxide emissions per unit of GDP was reduced by 18.8% compared with 2015 and 48.4% compared with 2005, all of which have already fulfilled China's commitment to the international community in 2020 ahead of schedule.	The project is to utilize the extracted CMM with low concentration methane concentration to produce electricity to avoid methane emissions. This contributes to achieve one of China's stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas"

1.18.2 Sustainable Development Contributions Activity Monitoring

During this monitoring period, about 56.700 million Nm³ of methane were destructured, and the exported electricity is about 184,341.61MWh, achieving emission reductions of 1,071,207 tCO₂e. Meanwhile, the project has created 68 long-term jobs. Refer to Table 1-2 for quantified sustainable development contributions. The Evidence have been added to Appendix 2.

¹⁵ <https://sdgs.un.org/goals/goal8>

¹⁶ <https://sdgs.un.org/goals/goal13>

Table 1-2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	Amount of electricity generation	Implemented activities to increase	The project has generated 184,341.61 MWh electricity during the first monitoring period (01-December-2022~31-August-2024), thus reduced the consumption of the corresponding fossil fuels of NCPG and contributed to increasing China's energy security.	This is the 1 st monitoring period, therefore, from the operation start date of the project activity to the end of this monitoring period, 184,341.61 MWh of electricity by utilizing the low CMM is generated by the project.
2)	8.5	Number of job opportunities provided	Implemented activities to increase	68 employees have signed long-term labour contracts and receive stable payments due to the implementation of the project activity. No further changes in this reporting period.	Provided 68 employment positions for local villagers in the first monitoring period.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The project achieved GHG emission reductions of 1,071,207 tCO ₂ e during the reporting period(01-December-2022~31-August-2024).	From 01-December-2022 to 31-August-2024, the project has achieved a GHG emission reduction of 1,071,207 tCO ₂ e.

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

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

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

The project's objective is to utilize the extracted CMM with low concentration methane concentration to produce electricity , Displacing part of the grid electricity mainly generated by fossil fuel combustion, thus reducing the emission of CO₂ and other air pollutants. The entire project must adhere to local regulations, rules, and obtain necessary permissions.

The following steps were adapted to identify stakeholders (basic on SBIA Manual):

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

This stakeholder's identification starts by listing all the people or groups who might have an influence over or be impacted by the

project. The local government, local resident and PP were considered to be the key informants and focus groups who know best about the project, thus PP held a brainstorm of stakeholder Identification in the government office of Dazhai Town on 25-October-2021, attended by PP shareholders and three staff members, four villagers, as well as two staff members of the government. Considering potential environmental impacts and social aspects from the power plant, stakeholders consist of residents near the power plant and coal mine, workers of power plant, workers of coal mine and government servants.

Step 2: Analyse the relevance of each stakeholder to the project and degree affected

This information can be summarized in Table below:

Stakeholder Analysis:

Stakeholder Category	Direct/Indirect Affected	Relevance to the Project Activity
Workers of the power plant	Direct affected	The workers will be provided jobs.
Residents near the power plant and coal mine	Direct affected	As they live in close proximity to the plant, they are directly impacted by its operations, including factors such as noise, odors, traffic, and potential environmental concerns. And they are offered jobs.
workers of coal mine	Direct affected	Their work directly contributes to the operations of the power plant, and they may be directly impacted by its activities, such as employment opportunities, working condition and income.

	Government servants in Bureau of Ecology and Environment, and Bureau of the Development and Reform Commission	Direct affected	These governmental bodies are directly involved in regulating and overseeing various aspects of the power plant's operations, including environmental regulations, and industrial development permits and licenses, and enforce compliance with relevant laws and regulations.
	Baineng New Energy (Shen Zhen) Co., Ltd	Indirect affected	Consultant of the carbon reduction project.
Step 3: Publish the results of identified stakeholder The results of identified stakeholders were publicly posted for 30d on the bulletin board in the villages, town and gateway on Shanxi Xiyang Fenghui coal industry Co., Ltd. Power Plant, in case there was any other person who may consider themselves as one of the project's stakeholders, they can directly contact the project proponent for consultation. After receiving no feedback and dissenting views, PP distributed notices, emails, phone calls and online notices on local village council announcements a week before the stakeholder consultation meeting to ensure broad participation of the identified stakeholders in the stakeholder consultation meeting.			
Legal or customary tenure/access rights	The Project is situated within the boundaries of an existing coal mine site. The project owner has obtained the real estate right certificate issued by the Xiyang County People's Government, and period of the land use is between 11/03/2016 to 13/02/2066. Therefore, during crediting period, the project owner has the legal right to use the project land, and there is no uncertainty or change in land tenure arrangements, resource access rights, community-based property rights and customary rights, access rights or land ownership. As of the current date, official government institutions and social movements have not recorded any conflicts related to land tenure		

	or access to resources in the project region.
Stakeholder diversity and changes over time	Stakeholder diversity: The workers of power plant, the local residents around the power plant and coal mine, the workers of coal mine and the local government are affected by the project activity directly. The workers of power plant and coal mine: These two groups comprise individuals with similar backgrounds, primarily local residents seeking employment opportunities in Xiyang County. While they may share similarities in their backgrounds, there might still be diversity within this group in terms of age, education level, previous work experience and income level. Over time, the makeup of this workforce may evolve as the project progresses, potentially influenced by factors such as workforce turnover, training opportunities, and changes in project requirements. Interactions among project workers could involve collaboration on tasks, skill-sharing, and fostering a supportive work environment. Residents near the power plant and coal mine: Residents living near the power plant and coal mine are of all ages and have different levels of education. Because of their different jobs, they have different incomes. Besides, they live in Dazhai Town, they have different social networks and ways of interacting with each other. Government servants in Bureau of Ecology and Environment, and Bureau of the Development and Reform Commission: These stakeholders focus on regulatory compliance, environmental protection, and economic development related to the project. Interactions among government officials could involve policy discussions, regulatory enforcement, and coordination efforts to address environmental and economic concerns associated with the project. Collaboration between government agencies and other stakeholders may be crucial for achieving project objectives while ensuring compliance with regulations and fostering sustainable development. But different government authorities may have different policies and regulations. Baineng New Energy (Shen Zhen) Co., Ltd:

	The project owner authorizes Baineng New Energy (Shen Zhen) Co., Ltd. as consultant to develop the VCS project. During the crediting period, the consultant remains unchanged. Therefore, each group differs from one member to another, but their group will not change much in social, economic, and culture over time.
Expected changes in well-being	The implementation of the project is expected to have a positive impact on the well-being and other characteristics of stakeholders. Relative to the baseline scenario where CMM is expelled directly into the atmosphere, the project will bring about the following changes: Environmental Impact Reduction: By implementing advanced technologies and sustainable practices, the plant endeavors to decrease greenhouse gas emissions and improve resource efficiency, thus mitigating the impacts of climate change and safeguarding ecosystem health. Moreover, initiatives aimed at minimizing air and water pollution, responsibly managing waste, and fostering a cleaner and healthier environment benefit both the plant and the surrounding communities. Community Engagement and Social Responsibility: Actively engaging with local communities through stakeholder consultation meetings, community outreach programs, and social responsibility initiatives can foster positive relationships and trust between power plant and its neighbors. By addressing community concerns, providing employment opportunities, the plant can contribute to enhanced social cohesion, economic prosperity, and overall well-being in the surrounding area. Economic Benefits: The power plant generate economic benefits for both the local community and the broader region. This includes creating job opportunities, and generating tax revenues for local governments. The Project ecosystem services mainly in atmospheric environment: The project generates electricity by extracting CMM, avoiding methane emissions into the atmosphere while providing clean electricity to coal mines and NCPG. It helps to reduce the impact of greenhouse gases on the climate. Thus, it is conducive to ensuring the safety, health, and living quality of stakeholders.

Location of stakeholders	The project locates in Dazhai Town, Xiyang County, Jizhong City, shanxi Province, China. And the stakeholders involved in the project located in Xiyang County, Jizhong City, shanxi Province, China. The stakeholders in the project area are primarily located in Xiyang County, Jizhong City, shanxi Province, China. These individuals and groups have a direct interest in the low concentration gas treatment methods in the area and will be directly impacted by the project. Since the project does not involve activities outside the project boundaries, areas outside the project area do not be affected by the project.
Location of resources	The location of territories and resources which stakeholders own or to which they have customary access are located in Xiyang County, Jizhong City, shanxi Province, China.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	29-October-2021
Stakeholder engagement process	Local stakeholder consultation was conducted by project owner during the project preparation stage. 50 questionnaires were distributed to local residents and government officials on 29-October-2021. The questionnaire was designed to assess the project impacts on the local environment and social economic development. To engage stakeholders in a culturally appropriate manner, the project proponent initiated a series of carefully planned activities. Firstly, a local stakeholder consultation meeting was held on 29-October-2021 at the company office of Shanxi Xiyang Fenghui coal industry Co., Ltd Power Plant. One week prior to this meeting, notices were distributed at local village committees' bulletins, and made government servants and other stakeholders who could not access to notices known by emails, phone and notices online to ensure broad participation from the community. During the consultation, stakeholders,

	including workers from coal mine, workers from the power plant, nearby residents, and relevant government officials, were informed about the project's purpose, content, benefits, and risks, all relevant laws and regulations covering workers' rights in China were introduced to stakeholders by PP. During the consultation meeting, specific attention was given to ensuring that all voices regardless of gender, were heard and respected, fostering an inclusive environment for discussion. Additionally, a stakeholder survey questionnaire was issued to gather diverse opinions and attitudes regarding the project's construction and its potential impacts on the local environment and socioeconomic development. The questionnaire was carefully designed to be culturally sensitive and accessible to all stakeholders. Despite sending out 50 questionnaires, the project team received a remarkable 100% response rate, with 42% women and 58% men. Furthermore, the survey results were meticulously documented to capture and analyze stakeholder feedback, ensuring transparency and accountability throughout the consultation process. This comprehensive approach, incorporating culturally appropriate communication methods and meticulous documentation of outcomes, facilitated meaningful engagement with stakeholders and informed decision-making processes related to the project.								
Consultation outcome	In addition, FPIC (Free, prior, and informed consent) was discussed to ensure the legitimacy and transparency of the project. The project also discusses the VCS validation and verification process to ensure the sustainability and environmental benefits of the project. Based on the results of the discussion at the meeting and the 50 questionnaires received for the survey, opinions are summarized as follows: <table><tr><th>Questions</th><th>Attitude or Opinion</th><th>Amount</th><th>Percentage</th></tr><tr><td>1.Do you know about the</td><td>Quite much</td><td>38</td><td>76%</td></tr></table>	Questions	Attitude or Opinion	Amount	Percentage	1.Do you know about the	Quite much	38	76%
Questions	Attitude or Opinion	Amount	Percentage						
1.Do you know about the	Quite much	38	76%						

	proposed project?	Heard of	10	20%
		Nothing	2	4%
	2.What is your attitude towards the project construction?	Supportive	46	92%
		Against	0	0%
		Indifferent	4	8%
	3.What is the most probable environmental impact do you think the project will cause after the construction finish? (multiple choice)	None	38	76%
		Air pollution	1	2%
		Water pollution	0	0%
		Noise pollution	2	4%
		Harm to indigenous animals and plants	0	0%
		No idea	9	18%
	4.Do you think the project operation will bring about more benefits than loss?	Yes	44	88%
		No	2	4%
		About the same	4	8%
	5.Are you willing to participate in the project construction or operation?	Yes	40	80%
		No	2	4%
		Indifferent	8	16%
	6.What influence do you think the project will bring about to you and	Positive	44	88%
		None	6	12%

	your family?	Negative	0	0%
	7.Do you think the project operation will affect the production safety of the coal mine?	Positive effect	47	94%
		None	3	6%
		Negative effect	0	0%
As per answers to questionnaires above, local stakeholders are supportive of construction of the project. A majority of surveyed stakeholders think the project will improve local economic development without adverse environmental impact. The survey shows that the stakeholders are supportive to the project.				
Ongoing communication	The project owner established the mechanism for on-going communication with local stakeholders. That is, a continuous Input / Grievance Expression Process Book is prepared at the guard of the project site, and any stakeholders can express their opinions and views on the project. Later after the project was put into operation, the project owner keeps communicating and consulting with local stakeholders actively. Depends on the types of inputs received from the stakeholders, actions will be taken to address their comments. Until now, no comments or Input / Grievance Expression received from stakeholder.			
Stakeholder input	During the continuous communication with stakeholders, the project has not received any complaints, comments or suggestions from stakeholders.			

2.1.3 Free Prior and Informed Consent

Obtaining consent	In order to obtain the consent and reach a transparent agreement from the stakeholders involved in the implementation of the project activities in Xiyang County, Jizhong City, shanxi Province, i, we conducted a comprehensive and transparent consultation process. This includes holding community meetings, individual discussions, and soliciting input from relevant community leaders and representatives. Before project construction
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	and implementation, all stakeholders expressed their approval for the construction and implementation of the project. During these consultations, PP provided detailed information about the project, including the nature, scale, speed, reversibility and scope of the proposed project or activity; The reason or purpose of the project and/or activity; Duration of project activities; Locations that will be affected; And a preliminary assessment of economic, social, cultural and environmental impacts, including potential risks and fair and equitable benefit-sharing, respecting the precautionary principle. In addition, we actively listen to concerns and feedback from our stakeholders and address any questions or concerns raised. Through this process, we were able to reach a transparent agreement with the community on the implementation of project activities. In addition, PP have been monitoring the situation in the community to identify any ongoing or unresolved conflicts that may be affected by the project. We take active steps to ensure that projects do not exacerbate or influence the outcome of these conflicts. This includes ongoing dialogue with communities and a commitment to adapt our approach as needed to avoid any negative impact on local dynamics.
Outcome of FPIC	Local stakeholders are supportive of construction of the project. A majority of surveyed stakeholders think the project will improve local economic development without adverse environmental impact. The survey shows that the stakeholders are supportive to the project. Here is no objection. The project is construction in industrial Park on Dazhai Town, which belongs to the industrial land. The project owner has obtained the real estate right certificate issued by the Xiyang County People's Government, and period of the land use is between 11/03/2016 to 13/02/2066. Therefore, during crediting period, the project owner has the legal right to use the project land. Therefore, the project does not involve land encroachment, non-

consensual resettlement of residents and forced relocation.

And before the construction of the project, the project proponent had communicated with the local villagers about the project schedule, project details, environment protection, carbon development, risks and benefits. All relevant arrangements are made with the prior and informed consent of stakeholders. And all stakeholders are supportive to the project.

2.1.4 Grievance Redress Procedure

Development process

In order to resolve complaints related to the project, we have developed a complaint resolution process with stakeholders to ensure fair, transparent and timely processing. Here are the grievance resolution steps we have developed in partnership with our stakeholders:

1. Receiving Complaints: Any complaints related to the project will be received and recorded. The project owner has placed a comment book at the guard of the project site and posted the contact person and contact information for stakeholders to submit complaints, either in writing, orally or through a designated contact person.

2. Hearing: Once a complaint is received, we will schedule a hearing or meeting so that stakeholders can express their views and concerns. This will provide an open platform to ensure that all relevant information is fully considered.

3. Response: Following the hearing or meeting, we will provide a written response confirming that we have understood and documented the stakeholder's complaint and explaining the actions we will take. This will ensure transparency and continuity of communication.

4. Resolution of Complaints: We will use our best efforts to resolve complaints within a reasonable period of time. This may include adopting appropriate conflict resolution methods, such as mediation, negotiation or other appropriate solutions. We will work with stakeholders to ensure they are satisfied with the solution.

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

Grievances received	Resolution and outcome
In this monitoring period, the project has not received any grievances.	/

2.1.5 Public Comments

Comments received	Actions taken
The project was open for public comment from 02-April-2024 to 02-May-2024 on the verra website. No comment was received during this period. https://registry.verra.org/app/projectDetail/VCS/5011	/

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Local governments such as Development and Reform Commission, Environmental protection bureaus are the supervision organization which is in charge of guiding and coordinating the

project's implementation. Local governments is in rich experience in carbon measurement, ecological environment and local community management during project implementation.

As the project proponent, Shanxi Xiyang Fenghui coal industry Co., Ltd. Power Plant has rich experience in the organization and management of CMM Power Generation projects in the local area.. The project proponent provides financial support and organizational management for the project.

Due to local government and PP lack the expertise in and prior experience implementing similar carbon, Baineng New Energy (Shen Zhen) Co., Ltd as a partner, signed a carbon asset development agreement with PP and provided carbon services for project. And the project proponent has developed a recruitment strategy to fill the skills and experience gaps.

Baineng New Energy (Shenzhen) Co.,Ltd is experienced in carbon measurement and monitoring. In the past, Baineng New Energy (Shenzhen) Co.,Ltd has successfully developed many different carbon projects, including validation and verification under VCS and CDM standard. This experience will help project proponent to ramp up the capability of project implementing and management.

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified	The project uses the low concentration coal mine methane to generate electricity and is a clean energy project. The land within the project boundaries has already been designated for industrial use and poses no natural and human-induced risks to the well-being of stakeholders.
Risks to stakeholder participation	No risk identified	According to the real estate ownership certificate, the project land type is industrial land and there is no trade-off like food security, land loss, loss of yields, negative impacts on livelihoods, and climate change adaptation which would be raised by the project. Instead, the project uses the low concentration coal mine methane to generate electricity and

		is a clean energy project which reduces greenhouse gas emissions and is beneficial to the local ecological environment.
Working conditions	No risk identified	No toxic and harmful substances will be produced during the operation of the project, which will cause harm to the human body. The project activities create jobs for local people, power generation technician. The project has strictly implemented national and industry regulations and standards on labor safety and health, as well as Chinese labor law and local requirements, mitigation measures have been undertaken as per the approved EIA to ensure the safety and healthy working environment. Hence, no risk about working conditions for stakeholders to participate in this project.
Safety of women and girls	No risk identified	This program does not admit underage girls. In the design phase of the project, the safety of women was taken into account and corresponding preventive measures were taken. For example, establish safe sanitation facilities to ensure that women are not subjected to gender discrimination or gender-based violence in the management. During the implementation of the project, all personnel involved in the project are regularly trained in gender sensitivity, including awareness of gender discrimination and gender-based violence, and how to prevent and respond to these issues. The project has

		established effective monitoring and reporting mechanisms so that women can report any safety issues or acts of gender discrimination, ensuring that their voices are adequately addressed and protected.
Safety of minority and marginalized groups, including children	No risk identified	Project activities provide equal job opportunities, do not discriminate against marginalized groups, and try to provide some social support and assistance for local marginalized groups; The project does not recruit child workers. Therefore, the project does not pose a risk to marginalized groups, including children.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	Pollutants identified is as follows: 1.Construction phase During the construction of the project, there may exist a. Wastewater consists of construction wastewater and domestic sewage discharged by construction personnel, b. Solid waste consists of Construction waste and a small amount of household waste, c. Noise derived from construction machinery and vehicles d. Construction dust. 2.Operation phase During the operation of	Measures has been identified in EIA of the project which has been approved by Environmental Protection Bureau of Jinzhong City. A short summary of Mitigation or preventative measure taken is presented below: 1.Construction phase a. The construction company set up a temporary sedimentation tank to precipitate and treat the construction wastewater for reuse. Meanwhile, rainwater drainage ditches were set up in the construction area to prevent the accumulation of water inside the plant, reduce the area of rainwater runoff in the plant, and reduce the impact of soil erosion; b. Construction waste conduct fixed-point stacking, part of the back for construction, the rest as fill

	the project, there may exist a. wastewater consists of domestic sewage and Circulation cooling system drainage; b. Air pollution consists of NOX discharged by internal combustion engine operation; c.Domestic garbage, gas filter dust, waste oil, waste oil drum and waste coolant d. Noise from equipment operation.	or road construction materials timely clearance; Household waste were timely cleared by the sanitation department, which sent to landfill; c. Select construction machinery and operation vehicles with low noise intensity, Set up temporary sound barriers, Arrange construction time, and strengthen management of construction personnel and environmental protection education; d. Construction dust: build physical closed enclosure, clean road regular, spray water, low speed or speed limit of vehicles, avoid windy weather operations, use tarpaulin while material transportation, stacking; The pollution generated in construction phase was very small after taking reasonable measures, and disappeared with completion of construction. According to the completion of environmental acceptance comments, the measures for the treatment of relevant pollutants during the construction period have been implemented, and all the requirements and indicators of the EIA have met the standards. 2.Operation phase a. Domestic sewage is discharged into its own sewage treatment station for treatment, and is not discharged, and the drainage of circulating cooling system and soft water system is clean drainage, which will not affect the
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		surrounding environment. According to the Technical Guidelines for Environmental Impact Assessment Surface Water Environment (HJ2.3-2018), the wastewater of the project is not discharged into the external environment, and the impact on the surface water environment is small. b. Air pollution comes from NO_x produced by the operation of internal combustion engines. This project filters the combustion-supporting air, adjusts the working parameters of the internal combustion engine, installs a set of automatic ignition device, and exhauts the treated waste directly into the atmosphere through a 10m high chimney. The exhaust gas has met the performance value of atmospheric pollutant emission stage V control requirements in the Emission Limits and Measurement Methods in the Vehicle Emission System(GB17691-2005). c. Domestic garbage and gas filter dust is timely cleared by the sanitation department, which sent to landfill. Waste oil, waste oil drum and waste coolant is temporarily stored in the hazardous waste temporary storage room, which will be timely handed over to the qualified unit for disposal ; d. Low-noise equipment is applied in the project, the equipment is equipped with vibration damping mats and the equipment are placed uniformly in the workshop to reduce
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		the impact of its noise on the surrounding environment by the blocking of the wall. On the basis of reasonable layout, the noise at the boundary of the plant can meet the requirements of category 2 standard of the "Environmental Noise Emission Standard for Industrial Enterprise Plant Boundary" (GB12348-2008).
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ¹⁷	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	The project uses the low concentration coal mine methane to generate electricity for the residents in the area without distinction in genders, races, religions, educational backgrounds or any other aspects. Similarly, Project Proponent does not discriminate in the recruitment process, providing equal employment opportunities and fair employment conditions to different nationalities, genders and races.
Sexual harassment	No risk identified	The project respects all rights granted to women by the Constitution of the People's Republic of China, the Labor Law of the People's Republic of China, and the Special Provisions on Labor Protection for Women Workers. There have been no complaints of sexual harassment since the project began. And the project has established a monitoring mechanism for complaints about sexual harassment to ensure that sexual harassment will not happen in the future.

¹⁷ 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.

Equal pay for equal work	No risk identified	The project proponent strictly abide by the labor law, and sign contracts with employees. Salaries are delimited according to different positions. The legitimate rights and interests of employees are protected by Chinese law. In case of disputes, employees may apply to the local government for labor arbitration.
Gender equity in labor and work	No risk identified	The project proponent employs women during the construction and operation period. The project has male and female employees of different genders, and there are female employees in management positions. There is no significant gender difference between female employees and male employees in terms of salary, promotion opportunities and welfare benefits, and employees of different genders have equal opportunities to obtain training and development resources. In regular employee satisfaction surveys, all employees feel that the project is treated equally in terms of gender and pay.
Forced labor	No risk identified	The project proponent strictly abide the labour law, established reasonable labor safeguards to protect the working environment and hours of employees and ensure that employees are not forced to work. The project is supervised by local labor authorities.
Child labor	No risk identified	The project proponent strictly abide the labour law, the workers under 18 years old will not be accepted. Meanwhile, the project will be subject to public scrutiny for developing carbon assets.
Human trafficking	No risk identified	The project proponent strictly abide the labour law, the project proponent will verify the identity of the employees, and if unidentified workers are found, the project proponent will reported to the local police.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	Each of workers has a contract that states his/her rights and

	obligations. The contract details comply with China labor laws. The project has a strict labor schedule and does not violate any employee rights. In addition, China has established a sound labor arbitration and litigation mechanism to fully protect the rights and interests of workers. Project workers recognized, respected and promoted the protection of the rights of IPs, LCs, and customary rights holders . Meanwhile, as the project investor and management operator, PP has made positive efforts in respecting and protecting human rights: PP actively work with local communities to provide equal employment opportunities between men and women, and no child labor, no forced labor. PP provide training and employment opportunities for local communities to upgrade their skills and participate in project implementation. PP prioritize working with local communities to ensure they can directly benefit from the project and participate in the decision-making process. PP respect the right of local communities about FPIC (Free, prior, and informed consent). PP listen to their views and aspirations. PP respect their traditional knowledge, culture and customs and fully consider their views and interests in the planning and implementation of projects. PP respect the rights of local communities to land and natural resources and ensure that projects do not infringe on their land tenure, resource access and traditional ways of livelihood.
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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 is located in Xiyang County, Jizhong City, Shanxi Province, China. Due to China's long history of development, economic, social and cultural exchanges have resulted in frequent population movements, and there are no indigenous people. The project is designed to utilizes coal mine gas for power generation and the project is constructed in the industrial park, the project does not involved cultural heritage, so this part is not applicable.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project is a construction built in State-owned construction industrial land, which does not involve infringement or occupation of property rights. Through a real estate title certificate issued by the Xiyang County People's Government PP has been granted the right to use the land for a period of 50 years. Therefore, the project activities will not affect the territorial, property and customary rights and interests of stakeholders and local people.

2.3.5 Benefit Sharing

Since the Xiyang County People's Government and Planning issued a real estate title certificate to the project proponent, the project will not affect property rights of stakeholders.. Therefore, there is no need to develop a benefit-sharing agreement.

However, the project will provide jobs for the neighbourhood and Provide on-grid power. These actions will be recorded in the project proponent's employee roster or labour contract, power supply contract and invoice.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk identified	According to EIA of the project, it is not involved impact on biodiversity and ecosystems.
Soil degradation and soil erosion	No risk identified	According to EIA of the project, it is not involved impact on soil degradation and soil erosion.
Water consumption and stress	No risk identified	The waste water generated by the project is collected by the sedimentation tank and used for greening, etc., and is not

discharged. Therefore, the project's activities do not result in significant water consumption or contribute to water stress.

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

2.4.2 Introduction of species

N/A. This table is not required for projects with no planting or species introduction.

2.4.3 Ecosystem conversion

N/A. The project is not a ARR, ALM, WRC or ACoGS project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The following methodology and tools are applicable to the project activity.

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0008	Abatement of methane from coal mines	08.0
Tool	02	Combined tool to identify the baseline scenario and demonstrate additionality	07.0
Tool	05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0
Tool	07	Tool to calculate the emission factor for an electricity system	07.0
Tool	24	Common practice	03.1

Tool	27	Investment analysis	14.0
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3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
ACM0008 (Version 08.0)	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 Xiyang Fenghui coal mine for power generation to supply electricity to the coal mines where the Project is located, and then to North China Power Grid (NCPG) if there is any electricity surplus. The working mining capacity of the Xiyang Fenghui coal mine is 1.2 million tonnes per year, and went into operation in July-2012, which is designed to service life of 30 years. 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) emissions as a result 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 purchased from the NCPG.

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; (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).	Applicable. The project uses CMM from Underground boreholes in the mine to capture pre mining CMM and surface goaf well, underground 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 power generation at the operational Xiyang Fenghui 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	NA. Xiyang Fenghui coal mine the project involved is not a case of open cast mine.

	methane.	
	The methodology does not apply to project activities with any of the following features: (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.	NA. The project does not involve the extraction or utilization of virgin coal bed methane. 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.	NA. 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.	NA. The project does not involve use and/or destruction of CBM or OCM.
Tool 02: Combined tool to identify the baseline scenario and demonstrate additionality (version 07.0)	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 power generation project.
Tool 05: Baseline, project and/or leakage	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:	Applicable. Only when the project is out of operation or abnormal operation, there is a small

emissions from electricity consumption and monitoring of electricity generation (version 03.0)	(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.	amount of electricity consumed by the project from the coal mine which is supplied by North China Power Grid (NCPG) (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 following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	Applicable. The electricity generated by the project is supplied to the coal mine and the surplus electricity is delivered to NCPG (Scenario III).
	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the	No captive renewable power generation technologies are installed to provide electricity in the project activity, in the

	baseline scenario or to sources of leakage. The tool only accounts for CO ₂ emissions.	baseline scenario or to sources of leakage.
Tool 07: Tool to calculate the emission factor for an electricity system (version 07.0)	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects)	Applicable. The project utilizes the low concentration coal mine methane (CMM) from Xiyang Fenghui coal mine for power generation to supply electricity to the coal mine and NCPG if there is any electricity surplus, that would otherwise be purchased from NCPG. Therefore the tool is applied to estimate the OM, BM and /or CM when calculating baseline emissions for the project.
	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two suboptions under the step 2 of the tool are available to the project participants, i.e. option II a and option II b. If option II a is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	In the host country as off-grid power generation is not significant. Therefore, emission factor for the project electricity system is calculated only for the grid power plants. Thus, this applicability criterion is satisfied.
	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I	Applicable. The project electricity system

	country.	is located in a non-Annex I country.
	Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	No biofuels involved in calculation of CO ₂ emission factor of the grid..
Tool 24: Common practice (version 03.1)	This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", 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.	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.
Tool 27: Investment analysis"(version 14.0).	This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", the guidelines "Non-binding best practice examples to demonstrate additionality for SSC project activities", or baseline and monitoring methodologies that use the investment analysis for the demonstration of additionality and/or the identification of the baseline scenario.	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	The baseline and monitoring

	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.	methodology refers to "Combined tool to identify the baseline scenario and demonstrate additionality". Therefore, this tool is applicable.
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3.3 Project Boundary

The spatial extent of the project boundary comprises:

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

For the project, the Xiyang Fenghui coal mine is the coal mine from where the methane is 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 included the project boundary 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.

(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, power generation units and waste heat recovery units installed and used in the Project.

(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".

For the project, the generated electricity will be supplied to the coal mine through the electricity distribution network in Xiyang Fenghui coal mine for internal coal mine consumption, and then to North China Power Grid (NCPG) if there is any electricity surplus. The generated electricity will replace the electricity that would otherwise have been purchased from the NCPG and displace equivalent amount of the electricity generated by NCPG dominated by fossil fuel-fired power plants. And electricity will be imported from NCPG if the project is in regular maintenance or stop operation. Thus, the power plants connected to NCPG were included in the project boundary.

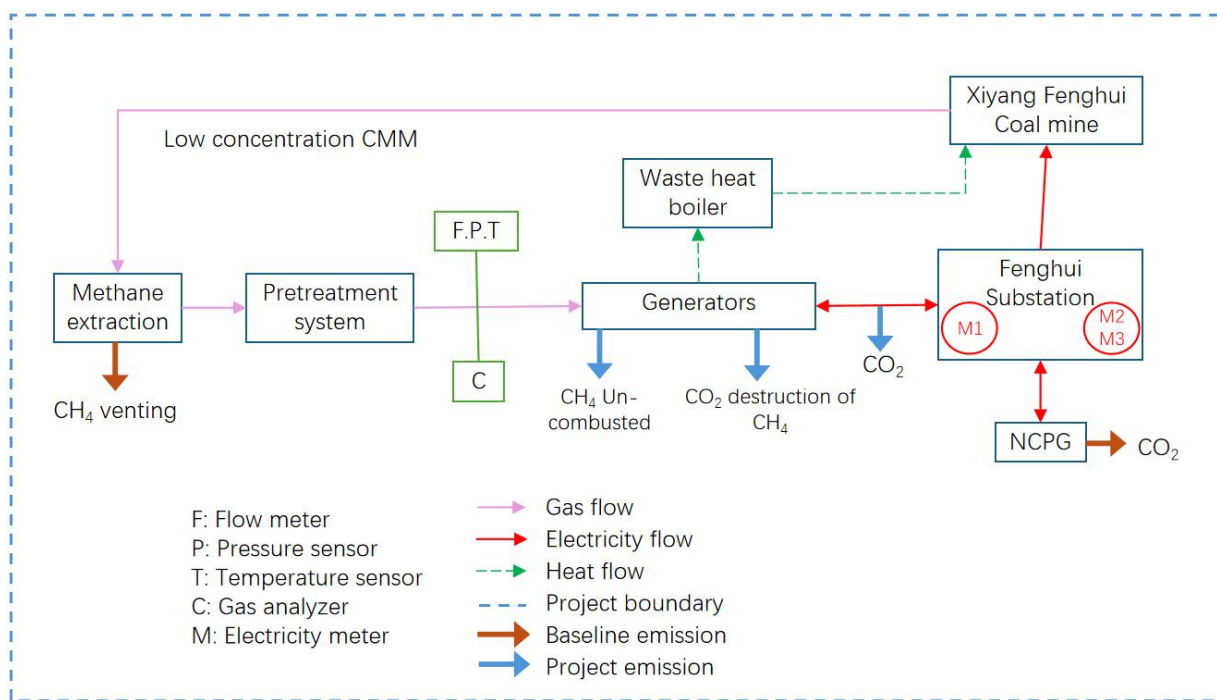


Figure 3-1 Diagram of the project boundary

The main emission sources and gases included in the project boundary are listed in Table 3-1 below:

Table 3-1 Emission sources included in or excluded from the project boundary

Source		Gas	Include d?	Justification/Explanation
Baseline	Methane emissions as a result of venting	CH ₄	Yes	Main emission source. CMM captured and sent to electricity generators 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. In absent of the project, the CMM is released into the atmosphere directly.
		CH ₄	No	Excluded for simplification.

Source		Gas	Include d?	Justification/Explanation
		N ₂ O	No	Excluded for simplification.
	Electricity generation (electricity provided to the grid and/or to the captive user), heat and vehicle fuel use	CO ₂	Yes	Only included if the project activity is to replace electricity from the grid, and emission reductions are claimed for 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 consumed when the Project is shutdown. During operation, all auxiliary demand can be met by electricity generated.
		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 combustion of CMM in gas engines in the project activity will be considered.
	Fugitive emissions of unburned methane	CH ₄	Yes	Unburned methane from gas engines will be considered.
	Fugitive methane emissions from on-site	CH ₄	No	Excluded for simplification. This emission source is assumed to be

Source	Gas	Included?	Justification/Explanation
equipment			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

This Step serves to identify all alternative scenarios to the proposed CDM project activity(s) which can be the baseline scenario.

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

This project description identifies all alternative scenarios that provide the same output (service or product) as the proposed VCS project activity from following aspects.

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.

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.

Options for energy production

All possible options to generate electricity at the coal mines in the Project include:

P1: Equivalent quantity of electricity supply from NCPG;

P2: Energy generated by using CMM captured, but not undertaken as VCS project;

P3: Construction of a coal-fired captive power plant with equivalent power supply; or construction of a captive power plant using other fossil fuels;

P4: Power generation using renewable energy resources e.g. hydro, solar or wind power.

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

Since the project doesn't involve the utilization of CBM/OCM, Option A1 is excluded. Regarding Option A2, it is in compliance with legal and regulatory requirements to handle methane to comply with safety regulations. Since the project doesn't involve the utilization of VAM, Option A3 is excluded. And since the coal mines involved in the project are not abandoned mines, Option A4 is excluded.

In conclusion, as Option A1, Option A3 and Option A4 are excluded. Option A5 is Option A2, is in compliance with legal and regulatory requirements to handle methane to comply with safety regulations.

b. Eliminate options to deal with methane

The extracted CMM utilized in the project is low concentration methane, which is below 30%. According to Article 184 of the Chinese National Coalmine Safety Regulation (2016)¹⁸, methane concentration in underground coal mine should be lower than 1% for safety operation, CMM with methane concentration below 30% is prohibited to be combusted directly, but can be either vented or utilized for power generation by internal combustion engines. Therefore, option B1 (venting of methane) complies with mandatory applicable laws and regulations. In fact, this is how methane was dealt with prior to the implementation of the project.

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

¹⁸ <https://www.mem.gov.cn/gk/zfxxgkpt/fdzdgknr/gz11/201602/W020211228709100172636.pdf>

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

The heat demand of the mining area has been able to be met by the boiler of the waste heat boiler of the unit, and there is no additional heat demand, no need for additional heating, so option B3 use of methane for heat generation is excluded.

The concentration and flow of CMM in coal mines are unstable, and the CMM gas sold to the high-pressure natural gas pipeline network should be purified to CH₄ concentration greater than 95%¹⁹. The project is located in Xiyang County, which is mainly composed of hills and mountains. The construction of pipeline project and investment are relatively large. Therefore, it is not suitable to transport to gas pipelines to be used as fuel for vehicles or gas production. Meanwhile, according to "the Urban Gas Specification" (GB50028-93), as urban gas, methane concentration of CMM should reach 36.8%~78.9%. so option B3 use of methane for energy generation, e.g. vehicle fuel, gas production is excluded.

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

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

c. Eliminate options for energy production

The actual installed capacity of the project is 24MW. According Notice of the General Office of the State Council on Strictly Prohibiting the Illegal Construction of 135MW and Below Thermal Power Units, the construction of coal-fired power plant with a capacity of 135MW or below is prohibited in the national grid coverage area²⁰. As stipulated by <Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators>, Fuel-fired (including oil and gas) power plants with an installed capacity of less than 100MW are strictly restricted for construction and fuel-fired (including oil and gas) power plants with an installed capacity of less than 25MW are strictly prohibited²¹. According to <Emission standard of coalbed methane/coal mine gas (on trial)>(GB21522-2008)²², only the CMM with the concentration higher than 30% should directly utilized. The project activity is not be mandated by any law, statute, or other

¹⁹ <https://www.doc88.com/p-5445414654435.html>

²⁰ https://www.gov.cn/gongbao/content/2002/content_61480.htm

²¹ Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators issued in August 1997
Link source: https://code.fabao365.com/law_223441_1.html

²² <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/dqhjbh/dqgdwrywrwpfbz/200804/W020111121355968126241.pdf>

regulatory framework. Therefore, construction of a power plant with the same capacity as the project using coal, diesel oil or natural gas as fuel would be prohibited. Option P3 is hence excluded.

In conclusion, options P1, P2 and P4 for energy production are in compliance with legal and regulatory requirements.

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	Energy production
Scenario 1 (A2+B1+P1)	Extraction of methane during and after the mining (CMM)	Venting	Equivalent quantity of electricity supply from NCPG
Scenario 2 (A2+B1+P2)	Extraction of methane during and after the mining (CMM)	Venting	Energy generated by using CMM captured, but not undertaken as VCS project
Scenario 3 (A2+B1+P4)	Extraction of methane during and after the mining (CMM)	Venting	Power generation using renewable energy resources e.g. hydro, solar or wind power
Scenario 4 (A2+B3+P1)	Extraction of methane during and after the mining (CMM)	Use of methane for electricity production	Equivalent quantity of electricity supply from NCPG
Scenario 5 (A2+B3+P2)	Extraction of methane during and after the mining (CMM)	Use of methane for electricity production	Energy generated by using CMM captured, but not undertaken as VCS project
Scenario 6 (A2+B3+P4)	Extraction of methane during and after the mining (CMM)	Use of methane for electricity production	Power generation using renewable energy resources e.g. hydro, solar or wind power

For scenario 2, this is a conflicted scenario for the methane is venting conflicted with methane utilized for electricity generation. Scenario 2 is unrealistic, as the CMM treatment of venting means that methane is emitted directly to air without any use, it is definitely conflicted to the scenario that generates energy by using CMM captured. Thus, scenario 2 does not exist.

For scenario 4, this is a conflicted scenario for use of methane for electricity production conflicted with equivalent quantity of electricity supply from NCPG. Thus, scenario 4 does not exist.

Step 2: Barrier analysis

Step 2a: Identify barriers that would prevent the implementation of alternative scenarios

Scenario 1: This is the continuation of business as usual and thus faces no barrier. It remains as a possible baseline scenario alternative.

Scenario 3: This scenario involves electricity generation using renewable energy sources. The Xiyang Fenghui coal mine, however, is a shortage of hydropower²³, wind power²⁴ and geothermal resources²⁵. As to for solar resources, due to the complex terrain in the Shanxi province, the contour of the annual total radiation is irregular, and its distribution characteristics are gradually increasing from south to north²⁶, Xiyang County (project location) is located in the central of Shanxi Province, and its annual solar radiation is relatively low, which is not an ideal location for building solar power stations. Last, the project site is located in coal mine area, no adequate rice, corn, cotton, peanut or any other biomass materials supplied for a biomass power.

Scenario 5: This is the project activity not implemented as a VCS project. This scenario faces investment barriers, which will be discussed in section 3.5.

Scenario 6: As shown scenario 3. The electricity generation using renewable energy sources in local area is facing kinds of barrier.

Step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

Based on step 2a, scenarios 2, 3, 4 and 6 are excluded, the scenarios to form the baseline scenario alternative that do not face barriers are:

Scenario ID	CMM extraction	CMM treatment	Energy production
Scenario 1 (A2+B1+P1)	Extraction of methane during and after the mining (CMM)	Venting	Equivalent quantity of electricity supply from NCPG
Scenario 5 (A2+B3+P2)	Extraction of methane during and after the mining (CMM)	Use of methane for electricity production	Energy generated by using CMM captured, but not undertaken as VCS project

²³ https://lib.cqvip.com/Qikan/Article/Detail?id=7104455777&from=Qikan_Search_Index

²⁴ <https://xueshu.baidu.com/usercenter/paper/show?paperid=89f8ae04129ddd4006721bf245112fa2#>

²⁵ http://journal25.magtechjournal.com/Jwk_dzdc/article/2018/2095-8706-5-5-13.html

²⁶ <https://www.cnki.com.cn/Article/CJFDTotal-SXJL200903008.htm>

There are no barriers identified that would prevent the implementation of either of the two alternative scenarios above. Therefore, neither of the two combined scenarios is eliminated by the step 2. The two combined scenarios need to be further discussed in section 3.5 Step 3.

3.5 Additionality

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 analyzed in section 3.4, the extracted CMM utilized in the project is low concentration methane, which is below 30%. According to Article 184 of the Chinese National Coalmine Safety Regulation (2016)²⁷, methane concentration in underground coal mine should be lower than 1% for safety operation, CMM with methane concentration below 30% is prohibited to be combusted directly, but can be either vented or utilized for power generation by internal combustion engines. According to <Emission standard of coalbed methane/coal mine gas (on trial)>(GB21522-2008)²⁸, only the CMM with the concentration higher than 30% should directly utilized. The project activity is not be mandated by any law, statute, or other regulatory framework, thus achieves regulatory surplus.

3.5.2 Additionality Methods

VCS Revenues have played an important role in the investment decision of the project. The Board meeting which was held on 21-February-2021 gave serious consideration to the VCS revenues to make the investment decision.

Table 3-2: Timeline of the major events of the Project

Time	Events
March-2021	FSR completed
March-2021	Environmental Impact Analysis (EIA) Report completed
19-May-2021	EIA Approval by Environmental Protection Bureau of Jinzhong City
27-September-2021	Project Approval by Shanxi Province Development and Reform Commission

²⁷ http://mem.gov.cn/gk/gwgg/agwzlf/zjl_01/201603/W020190705622814170708.pdf

²⁸ <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/dqhjbh/dqgdwrywrwpfbz/200804/W020111121355968126241.pdf>

21-October-2021	The project owner decided the project would be developed as VCS project.
29-October-2021	Questionnaire survey to collect the opinion of stakeholders
23-November-2021	Start construction date (at the same for the civil engineering contract date)
01-December-2022	Operation date

Step 3. Investment Analysis

According to "Combined tool to identify the baseline scenario and demonstrate additionality", the objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The latest approved version of the "Methodological tool: Investment analysis", shall be considered when applying this step.

The alternative scenarios of the project include:

Scenario 1 is the business as usual scenario, venting CMM does not create economic benefits, but no investment required for this scenario. Therefore, the investment analysis will not be conducted for this scenario.

Scenario 5: the project activity is implemented without being registered as a VCS project activity. The investment analysis will be conducted for this scenario.

Simple cost analysis, investment comparison and benchmark analysis are three options available for the investment analysis. As the Project generates direct financial benefits from electricity sales, the simple cost analysis is not applicable. The investment comparison is not applicable, either, because the only alternative (Scenario 1, the business-as-usual scenario) is not an investment project and cannot be applied in comparison. Benchmark analysis is considered as the appropriate analysis method for Scenario 5, and IRR is identified as the financial indicator for the benchmark analysis.

According to Economic Evaluation Method and Parameters for Construction Projects issued by National Development and Reform Commission (DRC) and Ministry of Construction, the benchmark project IRR of power generation sector was determined as 8% (before tax)^{29 30}. This

²⁹ P74 Table 2.13-2, Economic Evaluation Method and Parameters for Construction Projects issued by National Development and Reform Commission (DRC) and Ministry of Construction in 2006 (The third Edition).

³⁰ "Economical assessment and parameters for construction project, 3rd edition" was published by National Development and Reform Commission and Ministry of Housing and Urban Rural Development in 2006. The source. <https://www.doc88.com/p-140637270591.html>

Although <Economical assessment and parameters for construction project, 3rd edition> was published in 2006. But it is still valid and widely used in-the feasibility study reports of power plants in China, which could be also checked in the FSR of this Project. Thus, it is suitable and reasonable to be used in 2021 at the time of decision-making for the project.

project is a power generation plant, and the benchmark above can be applied to the project. In addition, this benchmark is also applied in the investment analysis of the Feasibility Study Report (FSR) completed on March-2021. The project owner decided the project would be developed as VCS project on 21-October-2021. The project FSR was approved by Shanxi Province Development and Reform Commission on 27-September-2021. The interval of FSR completion and investment decision is short enough to ensure no material changes of the investment.

Comparison of IRR for the project and the financial benchmark:

The main parameters for calculation of financial indicators are shown in the following table:

Table 3-3 Main parameters for financial analysis calculation

Item	Unit	Value	Source
Installed capacity	MW	24	FSR
Total static investment	CNY	193,980,000	FSR
Working capital	CNY	2,720,000	FSR
Annual operating hour	Hour	7,200	FSR
Annual electricity generation	MWh/year	172,800	FSR
Power self-consumption ratio	%	5.1	FSR
Annual electricity exported	MWh/year	163,990	FSR
Electricity Tariff (including VAT)	CNY/MWh	419	FSR
Electricity price (NCPG) (VAT included)	CNY/MWh	332	FSR
Electricity price (coal mine) (VAT included)	CNY/MWh	550	FSR
The share of electricity exported to NCPG	%	60	FSR
The share of electricity exported to coal mine	%	40	FSR
Income tax	%	25	FSR
Value added tax (electricity)	%	17	FSR
Municipal maintenance and construction tax	% of VAT	5	FSR

Surcharge for education		% of VAT	5	FSR
Depreciation period		Year	10	FSR
Scrap value of fixed assets		%	5	FSR
Annual operation and management (O&M) cost	Total	CNY	47,954,990	FSR
	Annual maintenance cost	CNY	9,699,000	FSR
	Annual Management cost (repair cost included)	CNY	3,279,796	FSR
	Annual staff salary and welfare	CNY	7,378,000	FSR
	Annual insurance	CNY	2,909,700	FSR
	Annual pollutant discharge fee	CNY	500,000	FSR
	Annual material fee (water and lubricant included)	CNY	17,628,903	FSR
	Annual other cost	CNY	6,559,592	FSR
Project operational lifetime		Year	10	FSR
Expected VER Price		CNY/tCO ₂ e	21	Estimated

Table 3-4 below shows the difference between the Project IRR, with and without the revenue from carbon.

Table 3-4 Comparison of financial indicators with and without the revenue from carbon

Item	Without the revenue from carbon	Benchmark rate	With the revenue from carbon
Project IRR (before tax)	1.67%	8%	14.33%

Sensitivity analysis

The sensitivity analysis is conducted to check whether, under reasonable deviations in four major financial parameters, the Project would remain financially unattractive, i.e. the Project IRR without the revenue from carbon would remain below the benchmark IRR. The four major financial parameters that significantly affect the Project IRR are:

- Total static investment

- Electricity tariff
- Annual O&M cost
- Annual Electricity exported

The impacts of the above parameters on the Project IRR were analyzed. The results of sensitivity analysis of the four indicators are shown in Table 3-5 and Figure 3-2.

Table 3-5 Sensitivity analysis of Project IRR to different financial parameters

Hypothetic change	-10%	-5%	0	5%	10%
Total Static Investment	4.63%	3.10%	1.67%	0.32%	-0.94%
Electricity Tariff	-4.57%	-1.32%	1.67%	4.44%	7.06%
Annual O & M Cost	5.55%	3.65%	1.67%	-0.42%	-2.63%
Annual Electricity Exported	-1.94%	-0.09%	1.67%	3.35%	4.97%

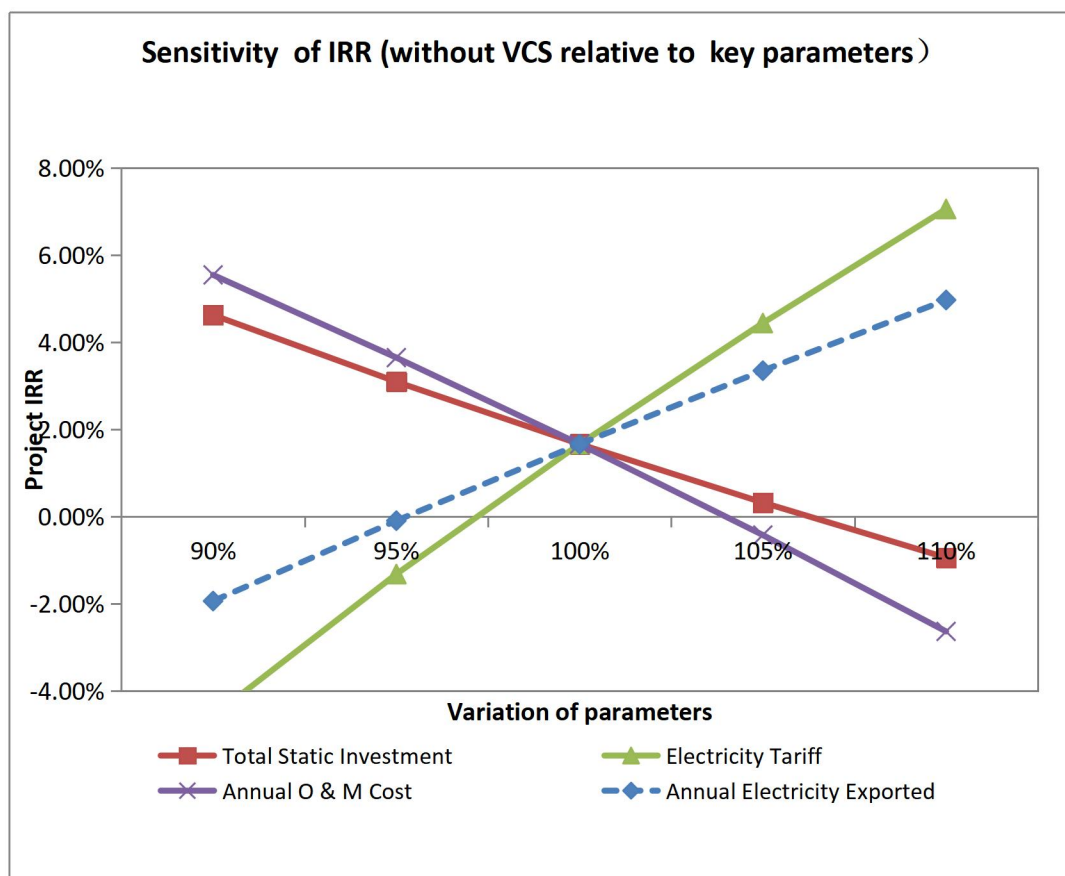


Figure 3-2 Sensitivity analysis of financial indicators of the Project

Table 3-6 below shows the necessary change in the four major parameters required for the Project IRR without VCU's revenue to reach the benchmark rate, ceteris paribus. All the speculated changes are clearly too large to be realistic.

Table3-6 Critical Point Analysis

Hypothetic Project IRR	Necessary Change in Total Static Investment Alone	Necessary Change in Electricity Tariff Alone	Necessary Change in Annual O&M Cost Alone	Necessary Change in Annual Electricity Exported Alone
Benchmark Rate 8%	-19.90%	11.86%	-16.75%	19.80%

Total static Investment

The project IRR would reach the benchmark rate of 8% when the total static investment decreases by 19.90%. According to the Monitoring report of completed environmental protection acceptance and Equipment purchase contract provided by the project owner, the actual investment of the project is 200,060,000 RMB, 103.13% of the total static investment. Therefore, it is impossible that the total static investment can be reduced by 19.90% to make the IRR to cross the benchmark.

Electricity Tariff

The project IRR would reach the benchmark rate of 8% when the tariff increased by 11.86 % up to 469 CNY/MWh³¹. According to Electricity Invoice with grid company and with coal mine in this monitoring period (01-December-2022~31-August-2024), the actual highest electricity tariff is 332 RMB/MWh (included VAT) and 550 RMB/MWh (included VAT) respectively, the share of electricity exported to NCPG and coal mine is 62% and 38%, weighted average of electricity price is 415 CNY/MWh, which is calculated by 332 CNY/MWh *62%+550CNY/MWh *38%. Therefore, it is unlikely that the tariff would increase by 11.86%.

Annual O&M cost

The project IRR would reach the benchmark when the Annual O&M cost decreases by 16.75%. Considering about the composition of the Annual O&M cost, the analysis focuses mainly on following items:

Raw material expenses. Based on statistics released by 2023 National Bureau of Statistics of China³², producer price indices for purchasing goods indicates an overall increasing cost in recent five years (99.3, 97.7, 111.0, 106.1 and 96.4) and therefore will not cause significant decrease. Wages and welfare. Based on statistics released by 2023 National Bureau of

³¹ 469 CNY/MWh=419 CNY/MWh*(1+11.86%).

³² <https://data.stats.gov.cn/easyquery.htm?cn=C01>

Statistics of China³³, the index of wages also shows an overall increasing in recent five years (109.8, 107.6, 109.7, 106.7 and 105.8). Therefore, there will not be decrease by 16.75% happened on wages and welfare.

According to the Operation and maintenance cost report provided by the project owner, the actual O&M cost on 2023 of the project is 50,898,400 RMB, 106.14% of the annual O&M cost in FSR.

Therefore, the IRR can't reach the benchmark by reducing annual O&M cost.

Annual electricity exported

The expected annual electricity generation of the project is 172,800 MWh (i.e., $172,800\text{MWh}=24.0\text{MW} \times 7200\text{h}$), 5.1% of which will be used for Internal consumption of the plant, thus the expected annual electricity exported for the project is 163,990MWh (i.e., $163,990\text{MWh}=172,800\text{MWh} \times (1-5.1\%)$). The annual electricity exported for the project is determined by a qualified third party based on 1) generator performance and 2) availability and stability of CMM supply. The generators cannot be ignited when the CMM concentration fall below 8%. In addition, at times of low concentration of CMM or fluctuation of CMM volume, some of the generators will only run at partial loads, essentially reducing the effective operation hour assuming full load. Actually, because of instability in CMM power supply, some of generators also run at partial loads.

During this monitoring period (from 01-Decmeber-2022 to 31-August-2024), the actual electricity exported of the project from the 24MW installed capacity is 184,341.61MWh, which is converted to an annual electricity exported of 105,132.32MWh (i.e., $105,132.32\text{MWh}=184,341.61\text{MW} \times 365 \text{ days}/640 \text{ days}$), 64.11%³⁴ of the annual electricity exported in FSR(163,990MWh). Hence, there is a little possibility that the annual electricity exported can be increased 19.80% to make IRR to reach the benchmark.

Based on the Investment Analysis, the alternative that the project activity not undertaken as a VCS project activity is not financially attractive to the project owner, and it is thus not baseline scenario.

Only one alternative scenario (Scenario 1) is left.

Step 4: Common practice analysis

The Guidelines on "Common Practice (version 03.1)" is followed as below.

Sub-step 4-1: Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the project activity. The designed annual capacity of methane destruction

³³ <https://data.stats.gov.cn/easyquery.htm?cn=C01>

³⁴ $105,132.32\text{MWh}/163,990\text{MWh}=64.11\%$

for CMM utilization of the project is 42.14 million Nm³. Range of +/- 50% of the capacity is from 21.07 million Nm³ to 63.21 million Nm³.

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

(a) The projects are located in the applicable geographical area. Since CMM projects located in the same province/region have similar grid structure, geological and transportation conditions and economic development, thus, only the projects located in Shanxi Province, P. R. China are chosen.

(b) The projects apply the same measure as the project activity. Thus, only the projects provided power generation based on CMM are chosen.

(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. Thus, only the projects use CMM are chosen.

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

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step sub-step 4-1. Thus, only projects have an annual capacity of methane destruction for CMM utilization is from 21.07 million Nm³ to 63.21 million Nm³ are chosen.

(f) The projects started commercial operation before the project design document is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the project activity. For common practice analysis, the start date should be as per CDM terminology. According to the "Glossary CDM terms", start date is defined that "for the CDM project activity, where a contract is signed for such expenditures, it is the date on which the contract is signed. In other cases, it is the date on which such expenditures are incurred. If the CDM project activity or CPA involves more than one of such contracts or incurred expenditures, it is the first of the respective dates." Therefore, the start date of project is the signing date of the Civil engineering contract, which is the earliest contract signed for project.

The signing date of the Civil engineering contract is 23- November-2021.

Thus, for the common practice analysis of the project, the applicable commercial operation starting date is before 23- November-2021.

Therefore, the CMM projects with an annual methane destruction capacity of 21.07 million Nm³ to 63.21 million Nm³ and started commercial operation before 23- November-2021 in Guizhou Province, which are not registered as other GHG Programs projects and are not undergoing validation, are counted as similar projects to the project.

Sub-step 4-3: Within the projects identified in Sub-step 4-2, identify those that are neither registered CDM/VCS/CCER project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all} .

For this sub-step, publicly available sources, China Electric Power Yearbook, the website of Shanxi Provincial Development and Reform Commission³⁵, UNFCCC website³⁶, Verra website³⁷, and China Certified Emission Reduction Exchange Info-Platform³⁸ are consulted. 8 CMM projects with an annual methane destruction capacity of 21.07 million Nm³ to 63.21 million Nm³ and started commercial operation before 23- November-2021 in Shanxi Province are list below:

Table 3-7 The CMM power generation projects in Shanxi Province that started commercial operation before 23- November-2021

No.	Project Title	GHG Program	Ref No	capacity of methane destruction for CMM utilization (million Nm ³)	Start date
1	Yangquan Coal Mine Methane (CMM) Utilization for Power Generation Project, Shanxi Province, China	CDM	892	48.14	1-May-2006
2	Shanxi Yangcheng Coal Mine Methane Utilization Project	CDM	1250	22.69	23-Oct-2005
3	Shanxi Coal Transport Market Co., Ltd. Yangquan Branch CMM Utilization Project	CDM	1319	43.21	30-Nov-2005
4	Jincheng Fengrun CMM Utilisation from Nine Mines in Jincheng City Shanxi	CDM	1928	57.88	2-Aug-2005

³⁵ <https://fgw.shanxi.gov.cn/>

³⁶ <https://cdm.unfccc.int/Projects/projsearch.html>

³⁷ <https://registry.verra.org/app/search/VCS/All%20Projects>

³⁸ <https://ccer.cets.org.cn/client/home>

	Province China				
5	Jincheng Chengzhuang 18 MW coal mine methane power generation project	CDM	3179	45.81	30-Mar-2007
6	Shaqu 14 MW CMM Power Generation Project in Shanxi Province (Phase I)	CDM	3190	21.70	11-Feb-2006
7	SDIC Xiyang Baiyangling CMM to power generation project	CDM	3219	29.00	31-Dec-2009
8	Huineng Low Concentration Coal Mine Methane Utilization Project	CDM	8006	24.37	18-Sep-2012
9	Liyang 15 MW Low-concentration CMM Power Generation Project	VCS	4499	25.50	01-Mar-2021

There were nine projects but which has successfully registered CDM/VCS/CCER project activities, project activities submitted for registration, project activities undergoing validation existed in Shanxi Province that started commercial operation before 23- November-2021. Therefore, they are not similar projects. Thus, $N_{all}=0$.

Sub-step 4-4: Within similar projects identified in Sub-step 4-3, 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} is also 0.

Sub-step 4-5: 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.

According to TOOL02 (version 03.1), the project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and $(N_{all} - N_{diff})$ is greater than 3.

For the Project, since $N_{all} = 0$ and $N_{diff} = 0$, $N_{all} - N_{diff} = 0$, less than 3. Therefore, the project activity is not a "common practice".

Outcome of Step 4:

Based on the analysis above, the baseline scenario of the project is:

Combination of A2, B1 and P1: Extraction of methane during and after the mining (CMM). Xiyang Fenghui coal mine was equipped with CMM extraction facilities and all extracted CMM was vented into the atmosphere directly; The electricity consumed at coal mine was supplied from North China Power Grid(NCPG) which is dominated by fossil fuel-fired power plants.

Therefore, the proposed project is additional.

3.6 Methodology Deviations

Not applicable. There is no methodology deviation for the project.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

According to the feasibility study report, the total installed capacity of the electricity generator is 24MW (2MW*12). During this monitoring period, 24MW (2MW*12) of installed capacity has been installed and started operation on 1-December-2022.

During this monitoring period from 01-December-2022 to 31-August-2024, 56.700 million Nm³ of methane were destructed, and the total exported electricity is about 184,341.61 MWh. The project has been operating smoothly with all equipment in normal operation and the construction of supporting online monitoring facilities and networking with local environmental protection authorities to establish a self-monitoring system.

There are no events or situations that occurred during the monitoring period which may impact the applicability of the methodology.

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, it involved no utilization of VAM, CBM and OCM. It utilizes the captured CMM for power generation. Thus, CMM captured and sent to electricity generators 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 (t CO 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 replaced by the project activity in year y(tCO ₂ e)

Methane destruction in the baseline

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

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

$$BE_{MR,y} = \sum_i \sum_s (MT_{PJ,s,i,y} - MT_{BL,s,i,y}) \times GWP_{CH_4} \quad (2)$$

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 (tCH ₄)
$MT_{BL,s,i,y}$	Methane from source s captured and destroyed by use i in the project activity in 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, thus $MT_{BL,s,i,y}$ is 0;

Thus,

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

Baseline emissions from the production of power, heat or vehicle fuels

The baseline emissions from displacement of power or heat generation, or supply of vehicle fuels are given by the following equation:

$$BE_{use,y} = \sum_k (EG_{use,k,y} \times EF_{k,y}) \quad (4)$$

Where:

$BE_{use,y}$	Baseline emissions from energy displaced by the project activity in year y (tCO ₂ e)
$EG_{use,k,y}$	Energy of type k displaced by the project activity in year y (energy unit);
$EF_{k,y}$	Baseline emissions factor for energy type k production in year y (t CO ₂ /energy unit)
k	Energy type displaced by the project activity

The waste heat from the generators of the project will be recovered by waste heat boilers to provide free hot water to the coal mines, which was provided by waste coal fired boilers before the implementation of the Project. However, to be conservative, emission reductions will not be claimed for this part. And for the project is not involved emission reduction from supply of vehicle fuels. Thus, in this part, the project is just involved the baseline emissions from the production of power.

Baseline emissions factor for power generation

According to the methodology ACM0008 (version 08.0), the emission factor for displaced electricity is calculated as per the latest version of methodological tool "Baseline, project

and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0), the parameter $EG_{use,k,y}$ in this PD is equivalent to the quantity of electricity generated and supplied by the project power plant to the grid in year y ($EG_{PJ,grid,y}$) in the tool. According to this tool, for the project is in the case of Scenario A: Electricity consumption from the grid, the project participants choose Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" (version 07.0) ($EF_{k,y} = EF_{grid,CM,y}$).

According to "Tool to calculate the emission factor for an electricity system" (version 07.0). The following six steps are applied to determine OM, BM, and CM used for calculating the project baseline emissions:

Step 1. Identify the relevant electricity systems

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

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

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

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

The Chinese DNA has published a delineation of the project electricity system and connected electricity systems, Option 1 is applied for the project. According to the delineations, the North China Power Grid(NCPG) is identified as the relevant electric power system of the project, which includes Beijing, Hebei, Shandong, Nei Monggol Autonomous Region, Shanxi, Tianjin Power Grids.

Step 2. Choose whether to include off-grid power plants in the project electricity system

(optional) Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

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

Based on China's real situation, only grid power plants are included in the calculation.

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

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

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

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, method (b) and method (c) is not suitable for the project.

The Simple OM method (a) can only be applied when low-cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years. For the NCPG the project activity connected to, the low-cost/must-run electric power resources generation accounts for the total grid total are 13.45%, 14.75%, 21.33%, 19.79% and 23.00% for 2017~2021 respectively, average value is lower than 50%, which satisfied the applicability of the method (a), therefore, the simple OM method is chosen for the calculation of the OM emission factor $EF_{grid,OM,y}$.

As per the latest version of “Tool to calculate the emission factor for an electricity system” (version 07.0), one of the following methods should be chosen to calculate the simple OM emission factor:

- Ex ante option: If the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS- PD to the DOE for validation, or
- Ex post option: If the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

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

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

Based on the analysis of the step 3, the simple OM method is used to calculate the NCPG OM emission factor in this step. The simple OM emission factor is calculated as the generation weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system. Option B can only be used if:

- 1) The necessary data for Option A is not available; and
- 2) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- 3) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2)

The data of each power plant serving the system is difficult to obtain. In this case, Option A is not preferred. In addition, according to the China Energy Statistical Yearbook, only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, and off-grid power plants are not included in the calculation. Therefore, Option B is chosen to calculate the OM emission factor.

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

$$EF_{grid,OMsimple,yL,el,y} = \frac{\sum_k (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_y} \quad (5)$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO ₂ emission factor in year y (tCO ₂ e/MWh)
$FC_{i,y}$	Amount of fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fuel type i in year (GJ / mass or

volume unit)

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

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

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

y The three most recent years for which data is available at the time of submission of the VCS-PDD to the DOE for validation.

Based on the most recent available data published by China DNA at the time of this PD submission, the three-year average operating margin emission factor is calculated as a full-generation-weighted average of the emission factors. Details of the calculations and data follow the published data from the Chinese DNA³⁹, which uses official national statistics.

$$EF_{grid,OMsimple,y} = 0.9652 \text{ tCO}_2/\text{MWh}$$

Step 5. Calculate the build margin (BM) emission factor

As per Section 6.5 of Tool 07 (version 07.0), in terms of vintage of data, project participants can choose between one of the following two options:

(a) Option 1 - For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period;

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

³⁹ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709437370462.pdf>

third crediting period, the build margin emission factor calculated for the second crediting period should be used.

In line with 2023 Baseline Emission Factors for Regional Power Grids in China, Option 1 is chosen for the project; the BM emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of this project description submission. The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET \geq 20\%$) and determine their annual electricity generation ($AEG_{SET \geq 20\%}$, in MWh);
- (c) From $SET_{5-units}$ and $SET \geq 20\%$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

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

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

If the annual electricity generation of that set comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f). Otherwise:

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

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

The BM emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m (EG_{m,y} \times EF_{EL,m,y})}{\sum_m EG_{m,y}} \quad (6)$$

Where:

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

As it is difficult to obtain the detailed data on the power generation, fuel consumption and thermal efficiency of each newly built power unit from public documents, a deviation of TOOL07 “Tool to calculate the emission factor for an electricity system” (07.0) is adopted following the clarifications given by the CDM EB concerning the BM emission factor calculation:

(1) The CDM EB suggested using the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin.

(2) The EB agreed the use of capacity additions during last 1~3 years for estimating the build margin emission factor for grid electricity.

(3) The EB also agreed to use of weights estimated using installed capacity in place of annual electricity generation.

The newly built power plants in the past few years are bundled into “grouped new power plant” according to their construction year, their province and their fuel type. The annual net electricity generation in the year y of each “grouped new power plant” $EG_{m,y}$ is estimated according to their total capacity and the average utilization hours, as the following equation:

$$EG_{m,y} = CAP_m \times H_{m,y} \quad (7)$$

Where:

$EG_{m,y}$	Annual net electricity generation the unit m in year y(MWh)
CAP_m	Installed capacity of the unit m (MW)
$H_{m,y}$	Utilization hour of the unit m in the year y (h), determined according to the average utilization hour of the same type of unit in the same province
y	The most recent year for which the generation data is available. For the calculation of BM in 2023, $y = 2021$
m	grouped new power plant

Since the newly built power plants in the same province (A), in the same year (t) and using the same fuel type (k) are grouped into "a grouped new power plant", CAP_m represents the total installed capacity of fuel type k power plants located in the provinces A and in the year t:

$$CAP_m = CAP_{A,t,k} \quad (8)$$

Where:

CAP_m	Installed capacity of the unit m (MW), with m representing the specified combination of A, t, and k
$CAP_{A,t,k}$	Total installed capacity of fuel type k power plants located in the province A and in the year t
A	Provinces covered by the NCPG, namely, Beijing City, Hebei Province, Shandong Province, Nei Monggol Autonomous Region, Shanxi Province, Tianjin City.
t	Years related to the grouped new power plants, for the 2023 calculation, t represents 2021, 2020, 2019.... Until the aggregated electricity generation of the grouped new power plants reaches 20% of the total electricity generation of the NCPG
k	Fuel type of the grouped new power plants, including hydro, thermal (coal, gas, oil, waste incineration, other thermal), nuclear, wind, solar and others.

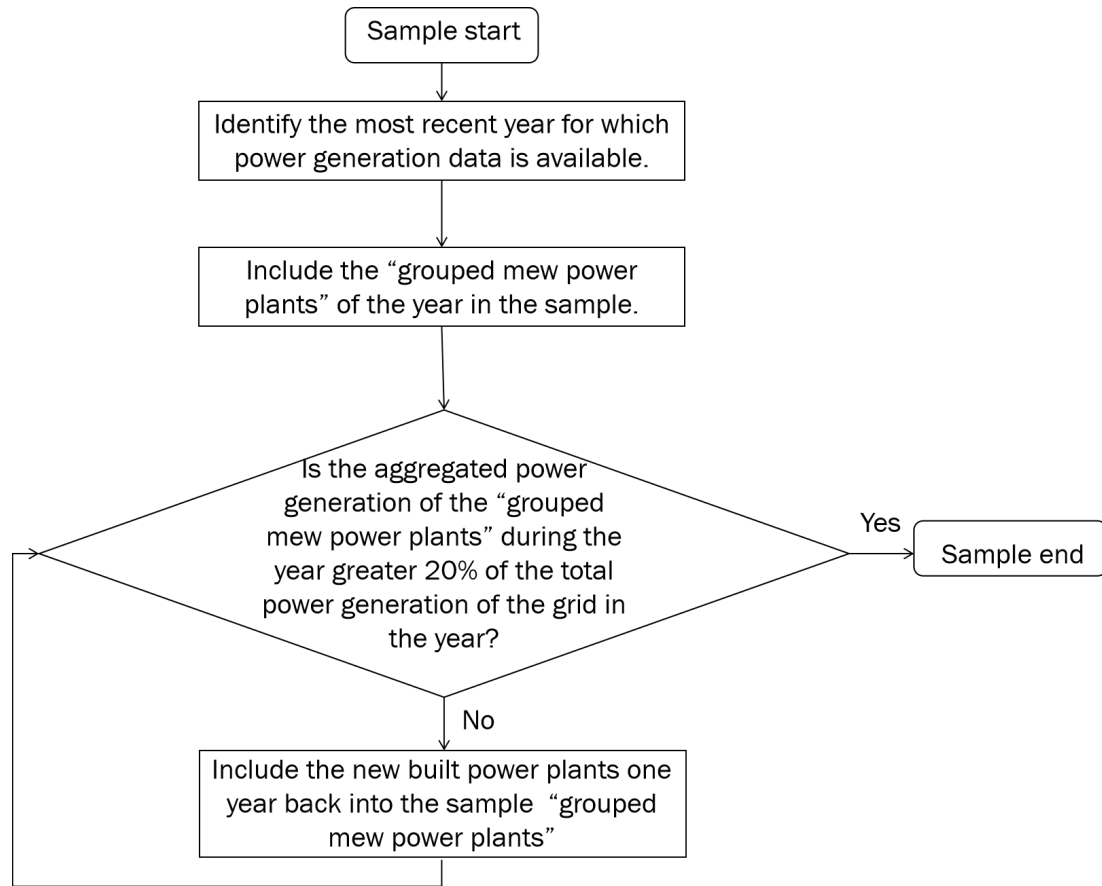


Figure 5-1: Procedure to determine the sample group of power units m used for the BM emission factor calculation

The emission factors of each fuel type are determined according to the Option A2 in the TOOL07, as the following equation:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (9)$$

Where:

$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y (t CO ₂ /MWh)
$EF_{CO2,m,i,y}$	Average CO ₂ emission factor of fuel type i used in power unit m in year y (t CO ₂ /GJ)
$\eta_{m,y}$	Average net energy conversion efficiency of power unit m in year y (ratio)
m	All power units serving the grid in year y except low-cost / must-run power units
3.6	Conversion factor (GJ/MWh)

Among the fuel types, the emission factors of hydro, nuclear, wind, solar, other thermal and others are 0. Concerning the emission factors of coal, gas, oil and waste incineration, the formula (10) takes the following form due to conservativeness:

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

Where:

$EF_{best,m,y}$	Emission factor of power unit m with the best technology commercially available in year y (t CO ₂ /MWh)
$\eta_{best,y}$	Power generation efficiency of the best technology commercially
m	Power units serving the grid with coal, gas, oil or waste incineration in year y

The calculation result of the BM emission factor for the NCPG is 0.3020 tCO₂/MWh Details of the calculations and the published data from the Chinese DNA⁴⁰)

$$EF_{grid,BM,y} = 0.3020 \text{ tCO}_2/\text{MWh}$$

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

As per the "tool to calculate the emission factor for an electricity system", the combined margin emission factor ($EF_{grid,CM,y}$) is calculated based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method (option a) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

The project activity is located in: (i) a Least Developed Country (LDC); or in (ii) a country with less than 10 registered CDM projects at the starting date of validation; or (iii) a Small Island Developing States (SIDS); and

The data requirements for the application of step 5 above cannot be met.

The PD choose option A.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (11)$$

⁴⁰ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709436742308.pdf>

Where:

$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)
Based on the description above, for NCPG, $EF_{grid,OM,y} = 0.9652$ tCO ₂ /MWh and $EF_{grid,BM,y} = 0.3020$ tCO ₂ /MWh.	

According to 'Tool to calculate the emission factor for an electricity system, the weights of OM and BM for all other projects except wind and solar power generation project activities are as follows:

$$\omega_{OM} = 0.5 \quad \omega_{BM} = 0.5$$

Thus, $EF_{grid,CM,y} = 0.9652 \text{ tCO}_2/\text{MWh} \cdot 0.5 + 0.3020 \text{ tCO}_2/\text{MWh} \cdot 0.5 = 0.63360 \text{ tCO}_2/\text{MWh}$.

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:

$$PE_y = PE_{ME,y} + PE_{MD,y} + PE_{UM,y} \quad (12)$$

Where:

PE_y	Project emissions in year y (t CO ₂ /y)
$PE_{ME,y}$	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 capture and utilize the CMM is supplied by the power generation of the project; Only when the project is out of operation or abnormal operation, there is a small amount of power 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.

Thus,

$$PE_{ME,y} = PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,i,y} \times (1 + TDL_{j,y}) \quad (13)$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO ₂ /y)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EF,i,y}$	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

According to "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0), $EF_{EF,i,y} = EF_{grid,CM,y}$. Furthermore, it is assumed that the amount of electricity consumed from the grid is zero ($EC_{PJ,j,y} = 0$) in ex-ante phase, which will be monitored in the verification period.

According to the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0), i) the project is the case of Scenario A: Electricity consumption from the grid; Thus, use as default values of 20% for (a) project or leakage electricity consumption sources, i.e. $TDL_{j,y} = 20\%$.

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.

$$PE_{MD,y} = \sum_i MD_{i,y} \times CEF_{CH_4} \quad (14)$$

Where,

$PE_{MD,y}$	Project emissions from methane destroyed (tCO ₂ e)
$MD_{i,y}$	Methane destroyed through use i (tCH ₄)
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 CO ₂ /t CH ₄)

As mentioned above, since emission reductions will not be claimed in heat generation. And for the project is not involved emission reduction from supply of vehicle fuels. The Project only involve in methane destroyed through power generation.

$$\text{Thus, } PE_{MD,y} = MD_{ELEC,y} \times CEF_{CH4}$$

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

$$MD_{i,y} = MM_{i,y} \times Eff_{i,y} \quad (15)$$

Where,

$MD_{i,y}$	Methane destroyed through use i in year y (t CH ₄)
$MM_{i,y}$	Methane measured sent to use i in year y (tCH ₄)
$Eff_{i,y}$	Efficiency of methane destruction in use I in year y (%)

$$\text{Thus, } PE_{MD,y} = MD_{ELEC,y} \times CEF_{CH4} = MM_{ELEC,y} \times Eff_{ELEC,y} \times CEF_{CH4} \quad (16)$$

Where,

$MD_{ELEC,y}$	Methane destroyed through use of power generation in year y (t CH ₄)
$MM_{ELEC,y}$	Methane measured sent to use i in year y (tCH ₄)
$Eff_{ELEC,y}$	Efficiency of methane destruction in use I in year y (%)

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:

$$PE_{UM,y} = GWP_{CH4} \times \sum_i MM_{i,y} \times (1 - Eff_{i,y}) \quad (17)$$

Where,

$PE_{UM,y}$	Project emissions from un-combusted methane (tCO ₂ e)
GWP_{CH4}	Global warming potential of methane (t CO ₂ e/t CH ₄)
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 CH ₄), i is only for electricity, so $MM_{i,y} = MM_{ELEC,y}$
$Eff_{i,y}$	Efficiency of methane destruction in use I in year y (%), i is only for electricity, so $Eff_{i,y} = Eff_{ELEC,y}$

$$\text{For the project, } PE_{UM,y} = GWP_{CH4} \times MM_{ELEC,y} \times (1 - Eff_{ELEC,y}) \quad (18)$$

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. The heat generated by the waste heat boilers are supplied for hot water for bathing for the workers in coal mine. And it could fulfil this heat demand. And there is no new heat demand, resulting into the CMM consumption in this project.

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 the FSR of the project, the estimated annual CMM measured sent to power plant will be 42.14 million m^3 CMM per year when the project is fully operated. The volume of CMM utilized by the project is estimated under the temperature of 293.15K, so the density of methane is $0.67kg/m^3$ ⁴¹. Therefore, the methane measured sent to power plant annually is calculated as follows:

$$MT_{PJ,s,i,y} = 42.14 \times 10^6 \times 0.67 \text{ kg}/m^3 / 1000 = 28,234 \text{ t CH}_4$$

1. Baseline Emission (BE_y)

1.1 Baseline emissions from methane destroyed

As described in 5.1, $BE_{MD,y} = 0$.

1.2 Baseline emissions from release of methane into the atmosphere

$$BE_{MR,y} = GWP_{CH_4} \times MT_{PJ,s,i,y} = 28 \text{ tCO}_2/\text{tCH}_4 \times 28,234 \text{ tCH}_4 = 790,546 \text{ tCO}_2e$$

1.3 Baseline emissions from power generation replaced by the project

$$BE_{Use,y} = EG_{Use,k,y} \times EF_{grid,CM,y} = EG_{PJ,grid,y} \times EF_{grid,CM,y} = 163,990 \text{ MWh} \times 0.63360 \text{ tCO}_2/\text{MWh} = 103,904 \text{ tCO}_2e$$

Baseline emissions are calculated by the formulation below:

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y} = 0 \text{ tCO}_2e + 790,546 \text{ tCO}_2e + 103,904 \text{ tCO}_2e = 894,450 \text{ tCO}_2e$$

2. Project Emission(PE_y)

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

As described in section 5.2, it is assumed that the amount of electricity consumed from the grid is zero ($EC_{PJ,i,y} = 0$) in ex-ante phase, which will be monitored in the verification period. Thus, $PE_{ME,y} = 0$ in ex-ante phase.

2.2 Project emissions from destruction of captured methane

⁴¹ 2019 refinement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories

$$\begin{aligned}
 PE_{MD,y} &= \sum_i MD_{i,y} \times CEF_{CH_4} \\
 &= MD_{ELEC,y} \times CEF_{CH_4} = MM_{ELEC,y} \times Eff_{ELEC,y} \times CEF_{CH_4} \\
 &= 28,234 \text{ t CH}_4 \times 99.5\% \times 2.75 \text{ tCO}_2/\text{tCH}_4 = 77,255 \text{ tCO}_2\text{e}
 \end{aligned}$$

2.3 Project emissions from un-combusted methane

$$PE_{UM,y} = GWP_{CH_4} \times MM_{ELEC,y} \times (1 - EF_{FELEC,y}) = 28 \text{ tCO}_2/\text{tCH}_4 \times 28,234 \text{ t CH}_4 \times (1 - 99.5\%) = 3,953 \text{ tCO}_2\text{e}$$

Project emissions are calculated by the formulation below:

$$PE_y = PE_{EC,y} + PE_{MD,y} + PE_{UM,y} = 0 \text{ tCO}_2\text{e} + 77,255 \text{ tCO}_2\text{e} + 3,953 \text{ tCO}_2\text{e} = 81,208 \text{ tCO}_2\text{e}$$

3. Leakage(LE_y)

As described in section 5.3, $LE_y = 0$.

4. Emission Reduction(ER_y)

The emission reduction (ER_y) by the project activity is:

$$\begin{aligned}
 ER_y &= BE_y - PE_y - LE_y \\
 &= 894,450 \text{ tCO}_2\text{e} - 81,208 \text{ tCO}_2\text{e} - 0 = 813,242 \text{ tCO}_2\text{e}
 \end{aligned}$$

Vintage period	Estimated baseline emissions (tCO ₂ e)	Estimated project emissions (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated reduction VCUs (tCO ₂ e)	Estimated removal VCUs (tCO ₂ e)	Estimated total VCUs (tCO ₂ e)
01-Dec-2022 to 31-Dec-2022 ⁴²	75,967	6,897	0	69,070	0	69,070
01-Jan-2023 to 31-Dec-2023	894,450	81,208	0	813,242	0	813,242
01-Jan-2024 to 31-Dec-2024	894,450	81,208	0	813,242	0	813,242
01-Jan-2025 to 31-Dec-2025	894,450	81,208	0	813,242	0	813,242
01-Jan-2026 to 31-Dec-2026	894,450	81,208	0	813,242	0	813,242

⁴² There are 31 days from 01-December-2022 to 31-December-2022, thus the estimated Baseline emissions, project emissions and ERs during 01-December-2022 to 31-December-2022 are calculated as the estimated annual values * 31/365 yr.

01-Jan-2027 to 31-Dec-2027	894,450	81,208	0	813,242	0	813,242
01-Jan-2028 to 31-Dec-2028	894,450	81,208	0	813,242	0	813,242
01-Jan-2029 to 31-Dec-2029	894,450	81,208	0	813,242	0	813,242
01-Jan-2030 to 31-Dec-2030	894,450	81,208	0	813,242	0	813,242
01-Jan-2031 to 31-Dec-2031	894,450	81,208	0	813,242	0	813,242
01-Jan-2032 to 30-Nov-2032 ⁴³	818,483	74,311	0	744,172	0	744,172
Total	8,919,730	812,080	0	8,132,420	0	8,132,420

6 MONITORING

6.1 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

⁴³ There are 335 days from 01-Jan-2032 to 30-Nov-2032, thus the estimated Baseline emissions, project emissions and ERs during 01-Jan-2032 to 30-Nov-2032 should be calculated as the estimated annual values * 335/366 yr. However, the estimated Baseline emissions, project emissions and ERs are calculated conservatively as 894,450 tCO₂e-75,967 tCO₂e=818,483 tCO₂e, 81,208 tCO₂e-6,897 tCO₂e=74,311 tCO₂e and 813,242 tCO₂e-69,070 tCO₂e=744,172 tCO₂e.

Comments	In the baseline scenario, there is no CMM captured and destroyed, thus $MT_{BL,S,I,y}$ is 0
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Data / Parameter	CEF_{CH_4}
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 f project emissions
Comments	$44/16 = 2.75\text{tCO}_2\text{e/tCH}_4$

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO ₂ /MWh
Description	Operating margin emission factor of the grid connected (NCPG)
Source of data	1. 2023 Baseline Emission Factors for Regional Power Grids in China⁴⁴, and Calculation Instructions for 2023 Baseline OM Emission Factors for Regional Power Grids in China⁴⁵ published by the National Center for Climate Change Strategy and International Cooperation (NCSC); 2. TOOL07: "Tool to calculate the emission factor for an electricity system" (version 07.0)

⁴⁴ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709436742308.pdf>

⁴⁵ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709437370462.pdf>

Value applied:	0.9652
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per TOOL07 (version 07.0) based on official data published by the National Center for Climate Change Strategy and International Cooperation (NCSC)
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	The value is calculated ex ante and fixed during the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build margin emission factor of the grid connected (NCPG)
Source of data	1. 2023 Baseline Emission Factors for Regional Power Grids in China⁴⁶, and Calculation Instructions for 2023 Baseline BM Emission Factors for Regional Power Grids in China⁴⁷ published by the National Center for Climate Change Strategy and International Cooperation (NCSC); 2. TOOL07: “Tool to calculate the emission factor for an electricity system” (version 07.0)
Value applied:	0.3020
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per TOOL07 (version 07.0) based on official data published by the National Center for Climate Change Strategy and International Cooperation (NCSC)
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	The value is calculated ex ante and fixed during the crediting period.

⁴⁶ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709436742308.pdf>

⁴⁷ <http://www.ncsc.org.cn/SY/zywj/202407/W020240709709439048191.pdf>

Data / Parameter	w_{OM}
Data unit	-
Description	Weighting of operating margin emission factor
Source of data	TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0)
Value applied:	50%
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

Data / Parameter	w_{BM}
Data unit	-
Description	Weighting of build margin emission factor
Source of data	TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0)
Value applied:	50%
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

Data / Parameter	$EF_{k,y}, EF_{EF,j,y} (EF_{grid,CM,y})$
Data unit	tCO ₂ /MWh
Description	Combined margin emission factor for the grid in year y
Source of data	"2023 Baseline Emission Factors for Regional Power Grids in China" published by DNA of China
Value applied:	0.63360
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per TOOL07 (version 07.0) based on official data published by the National Center for Climate Change Strategy and International Cooperation (NCSC)
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	D _{CH4}
Data unit	kg/m ³
Description	Density of methane under normal conditions of temperature and pressure
Source of data	2019 Refinement to 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 sources captured and destroyed by the project activity in mass unit. For $MT_{PJ,s,i,y}$ ($MM_{ELEC,y}$) is monitored by flow meter in volume unit, which will be converted to mass unit with the parameter of D _{CH4} .

Comments	Applies at atmospheric pressure and 20°C
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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 from the monitored data
Description of measurement methods and procedures applied	$MT_{PJ,s,i,y}$ is calculated by the gas flow rate, pressure, temperature and CH ₄ concentration of CMM, which will be continuously measured by pressure sensor, temperature sensor, flow meter and gas analyzer, record data hourly and aggregated monthly. The amount of methane utilized in power generation is thus calculated based on the monitored data.
Frequency of monitoring/recording	Continuous monitoring, hourly recording and monthly aggregating
Value applied:	28,234 (Ex ante from FSR)
Monitoring equipment	Flow meter, pressure sensor, temperature sensor, and gas analyzer (Related parameters are listed in Table 6-2) simultaneously measures the CMM flow, temperature and pressure; a gas analyzer measures the methane concentration.
QA/QC procedures applied	Flow meter, pressure sensor, temperature sensor, and gas analyzer 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 1138-2017) respectively. The accuracy of the equipments also should meet these standards. 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	For $MT_{PJ,s,i,y}$ is monitored by flow meter in volume unit, which will

	be converted to mass unit with the parameter of D_{CH_4} .
Comments	Flow meter, pressure sensor, temperature sensor will 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 (2019 refinement to 2006 IPCC).

Data / Parameter	$MM_{ELEC,y}$
Data unit	tCH_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 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 will be continuously measured by flow meter, pressure sensor, temperature sensor, and gas analyzer, record data hourly and aggregated monthly. The amount of methane utilized in power generation is thus calculated based on the monitored data.
Frequency of monitoring/recording	Continuous monitoring, hourly recording and monthly aggregating
Value applied:	28,234 (Ex ante from FSR)
Monitoring equipment	Flow meter, pressure sensor, temperature sensor, and gas analyzer (Related parameters are listed in Table 6-2) simultaneously measures the CMM flow, temperature and pressure; a gas analyzer measures the methane concentration.
QA/QC procedures applied	Flow meter, pressure sensor, temperature sensor, and gas analyzer 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 1138-2017) respectively. The accuracy of the equipments also should meet these standards. 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 project emissions
Calculation method	For $MM_{ELEC,y}$ is monitored by flow meter in volume unit, which will be converted to mass unit with the parameter of D_{CH_4} .
Comments	Flow meter, pressure sensor, temperature sensor will 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	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 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 applied	-
Purpose of data	Calculation of baseline emissions and 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	Methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (v03.0)
Description of measurement methods and procedures applied	Methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) default value
Frequency of monitoring/recording	The parameter will be updated according to the relevant documents
Value applied:	20%
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	The parameter will be updated according to Methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

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 applied	Bidirectional electricity meter is applied to measure the amount of electricity exported by the project activity. The data is daily recorded, monthly aggregated.
Frequency of monitoring/recording	Measured continuously, daily recorded, monthly aggregated
Value applied:	163,990 (Ex ante from FSR)

Monitoring equipment	Bidirectional electricity meters, related parameters are listed in Table 6-2.
QA/QC procedures applied	Electricity transaction notes (ETNs) will be used for cross-check, and the conservative values will be selected. The Electricity meters is calibrated annually in compliance with the industry standard Technical administrative code of electric energy metering (DL/T448-2016), and the accuracy of the meters also should meet the standard. All electronic data and paper documents will be archived for two years following the end of the 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
Source of data	Monitoring data provided by the project owner
Description of measurement methods and procedures applied	Bidirectional electricity meter is applied to measure the amount of electricity exported by the project activity. The data is daily recorded, monthly aggregated.
Frequency of monitoring/recording	Measured continuously, daily recorded, monthly aggregated
Value applied:	0(Ex ante from FSR)
Monitoring equipment	Bidirectional electricity meters, related parameters are listed in Table 6-2.
QA/QC procedures applied	Electricity transaction notes (ETNs) will be used for cross-check, and the conservative values will be selected. Electricity meters is calibrated annually in compliance with the industry standard Technical administrative code of electric energy metering

	(DL/T448-2016), and the accuracy of the meters also should meet the standard. 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	-

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 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Description of measurement methods and procedures applied	IPCC reference
Frequency of monitoring/recording	-
Value applied:	99.5
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	The parameter will be updated according to IPCC.

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 Figure 6-1 shows the positions of the monitoring instruments and Table 6-1 lists the corresponding parameters monitored:

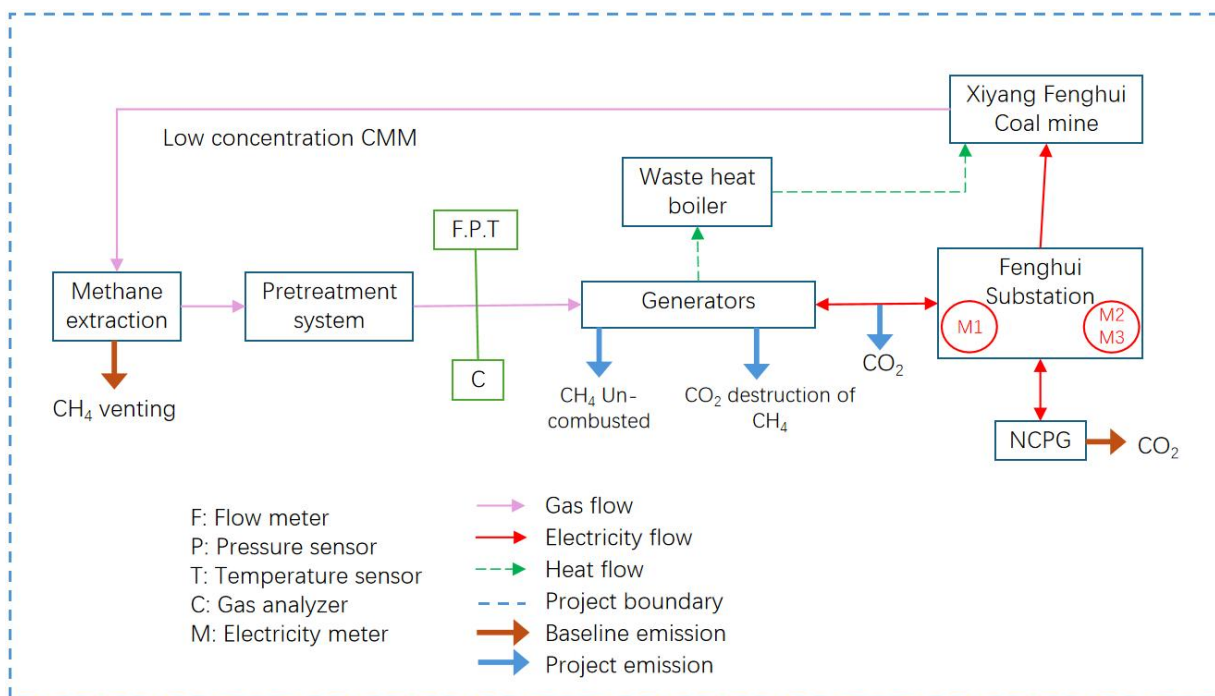


Figure 6-1: Project monitoring diagram

Table 6-1: Corresponding parameters monitored

Position	Parameter Monitored	Description
CMM Inflow Monitoring: the flow meter with pressure sensor and temperature sensor and gas analyzer 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: Electricity meter (M1) is installed at the delivery side of Fenghui power plant to	$EG_{use,k,y}$ ($EG_{PJ,grid,y}$)、	Electricity generation by the project and electricity consumption for the project activity are continuously

monitor the electricity delivered to NCPG and the electricity imported from NCPG. Electricity meter (M2 and M3) are installed at side of Fenghui power plant to monitor the electricity delivered to Xiyang Fenghui coal mine⁴⁸.	$EC_{PJ,y}$	monitored.
/	GWP_{CH4} 、 $Eff_{i,y}$ $(Eff_{ELEC,y})$ 、 $TDL_{j,y}$ 、 $EF_{grid,CM,y}$	Global warming potential of methane, efficiency of methane destruction in use i, average technical transmission and distribution losses for providing electricity to source j in year y will be updated according to relevant data sources, and the combined margin emission factor are fixed in the crediting period.

Table 6-2: Information of monitoring equipment installed in the first monitoring period

Equipment	Position	Model	Serial No.	Accuracy	Date of calibration	Validity	Parameter monitored
Flow meter	CMM inlet of the power generators	FFM61S 700	F61-1607-0097	$\pm 0.5\%$	18-Oct.-2022; 18-Oct.-2023	17-Oct.-2023; 17-Oct.-2024	$MT_{PJ,S,i,y}$ and $ME_{ELEC,y}$
Pressure sensor		WT3000	1232201 0058	$\pm 0.075\%$	18-Oct.-2022; 18-Oct.-2023	17-Oct.-2023; 17-Oct.-2024	

⁴⁸ The electricity delivered to Xiyang Fenghui coal mine is equal to the sum of the meter M2 monitoring data plus the meter M3 monitoring data.

Temperature sensor		JWSM-6ATD	30311018	$\pm 0.5^{\circ}\text{C}$	18-Oct.-2022; 18-Oct.-2023	17-Oct.-2023; 17-Oct.-2024	
Gas analyzer		GTR 196(EX)	60244/15	$\pm 2\%$	18-Oct.-2022; 18-Oct.-2023	17-Oct.-2023; 17-Oct.-2024	
Electricity meter(M1)	at the delivery side of Fenghui power plant	DSZ876	1703100022	0.2S	09-Oct.-2022; 09-Oct.-2023	08-Oct.-2023; 08-Oct.-2024	$EG_{use,k,y}$ $(EG_{PJ,grid,y}),$ $EC_{PJ,j,y}$
Electricity meter(M2)	at the side of Fenghui power plant	DSZ876	1612100090	0.2S	09-Oct.-2022; 09-Oct.-2023	08-Oct.-2023; 08-Oct.-2024	
Electricity meter(M3)	at the side of Fenghui power plant	DSZ876	1612100091	0.2S	09-Oct.-2022; 09-Oct.-2023	08-Oct.-2023; 08-Oct.-2024	

(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 6-2 shows the operation and management structure of the Project.

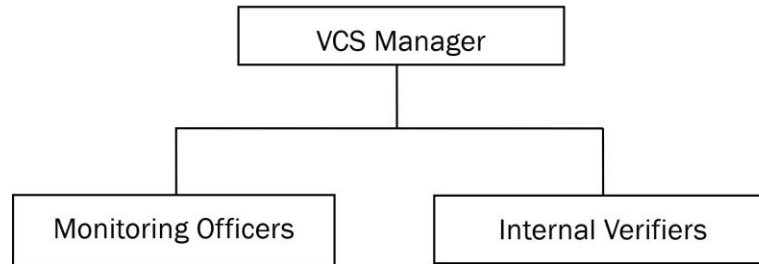


Figure 6-2 Operation and management structure of the project

(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 "DL/T448-2016 Technical Administrative Code of Electric Energy Metering"⁴⁹. The accuracy should not be less than 0.2S. The installation of flow meter, pressure sensor, temperature sensor and gas analyzers will fulfill the national standard (JJG1029-2007, JJG 882-2019, JJF1183-2007 and JJG 1138-2017). 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

⁴⁹ <http://www.doc88.com/p-2377330908298.html>

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	
Value applied:	Year	Value
	01-December-2022 to 31-December-2022	1088.98
	01-January-2023 to 31-December-2023	19795.94
	01-January-2024 to 31-August-2024	17,104.18
	Total	37,989.10
	Please refer to ER spreadsheet for monthly values.	
Comments	$MT_{PJ,s,i,y}$ was calculated by the gas flow rate, pressure, temperature and CH₄ concentration of CMM. Flow meter, pressure sensor, temperature sensor measured gas volumes, pressure and temperature. Volumes of methane under normal conditions of temperature and pressure continuously, recorded hourly and aggregated monthly. Gas analyzer measured the concentration of CH₄ continuously, recorded hourly and aggregated monthly. Gas analyzer was calibrated annually according to the relevant standard "Non-dispersive Infrared Methane Transmitters for Coal Mine (JJG1138-2017)". Flow meter, pressure sensor and temperature sensor are calibrated	

	annually in compliance with Industry standard Float Flow Meter (JJG257-2007), Pressure Transmitters (JJG 882-2019) and, Calibration Specification of the Temperature Transmitter (JJF1183-2007) respectively. Please refer to Table6-2 for calibration information. All electronic data and paper documents were archived for two years following the end of the crediting period.
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Data / Parameter	MM _{ELEC,y}											
Data unit	tCH ₄											
Description	Methane measured sent to use of power generation in year y											
Value applied:	<table><tr><th>Year</th><th>Value</th></tr><tr><td>01-December-2022 to 31-December-2022</td><td>1088.98</td></tr><tr><td>01-January-2023 to 31-December-2023</td><td>19795.94</td></tr><tr><td>01-January-2024 to 31-August-2024</td><td>17,104.18</td></tr><tr><td>Total</td><td>37,989.10</td></tr></table>	Year	Value	01-December-2022 to 31-December-2022	1088.98	01-January-2023 to 31-December-2023	19795.94	01-January-2024 to 31-August-2024	17,104.18	Total	37,989.10	
	Year	Value										
	01-December-2022 to 31-December-2022	1088.98										
	01-January-2023 to 31-December-2023	19795.94										
	01-January-2024 to 31-August-2024	17,104.18										
	Total	37,989.10										
Please refer to ER spreadsheet for monthly values.												
Comments	MM _{ELEC,y} (same with MT _{PJ,s,i,y}) was calculated by the gas flow rate, pressure, temperature and CH ₄ concentration of CMM.											
	Flow meter, pressure sensor, temperature sensor, and gas analyzer are calibrated annually in compliance with Industry standard Float Flow Meter (JJG257-2007), Pressure Transmitters (JJG 882-2019), Calibration Specification of the Temperature Transmitter (JJF1183-2007) and Non-dispersive Infrared Methane Transmitters for Coal Mine (JJG 1138-2017) respectively. The data measured continuously , recorded hourly and aggregated monthly. Please refer to Table 6-2 for calibration information.											

	All electronic data and paper documents were archived for two years following the end of the crediting period.
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Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/ tCH ₄
Description	Global warming potential of methane
Value applied:	28
Comments	According to the VCS Standard-V4.7, the GWP _{CH4} value from the IPCC Fifth Assessment Report (AR5) was used.

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	
Value applied:	Year	Value
	01-December-2022 to 31-December-2022	5122.88
	01-January-2023 to 31-December-2023	94432.74
	01-January-2024 to 31-August-2024	84,785.99
	Total	184,341.61
	Please refer to ER spreadsheet for monthly values.	
Comments	The electricity supplied to NCPG was measured by electricity meter M1 continuously and recorded monthly, the electricity supplied to coal mine was measured by electricity meter M2 and M3 continuously and recorded monthly. The total supplied electricity is the sum of M1 ,M2 and M3 readings.	

	For the data of electricity exported to grid company: Electricity transaction notes with grid company have been provided for crosscheck. The data from ETNs is consistent with monthly report during this monitoring period. All electronic data and paper documents were archived for two years following the end of the crediting period. For the data of electricity exported to coal mine: Electricity transaction notes with coal mine have been provided for crosscheck. The data from ETNs is consistent with monthly report during this monitoring period. All electronic data and paper documents were archived for two years following the end of the crediting period. The electricity meter was calibrated annually according to the industrial standard "Technical administrative code of electric energy metering (DL/T448-2016)" Please refer to Table 6-2 for calibration information.
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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:	<table><tr><td>Year</td><td>Value</td></tr><tr><td>01-December-2022 to 31-December-2022</td><td>0.28</td></tr><tr><td>01-January-2023 to 31-December-2023</td><td>9.52</td></tr><tr><td>01-January-2024 to 31-August-2024</td><td>6.72</td></tr><tr><td>Total</td><td>16.52</td></tr></table>		Year	Value	01-December-2022 to 31-December-2022	0.28	01-January-2023 to 31-December-2023	9.52	01-January-2024 to 31-August-2024	6.72	Total	16.52
Year	Value											
01-December-2022 to 31-December-2022	0.28											
01-January-2023 to 31-December-2023	9.52											
01-January-2024 to 31-August-2024	6.72											
Total	16.52											
Comments	The electricity consumed by the project is imported from NCPG to the power plant, and the electricity is measured by electricity meter (M1) continuously and recorded monthly. For the data of electricity imported from NCPG to the power											

	plant: Electricity transaction notes from grid company have been provided for crosscheck. The data from ETNs is consistent with monthly report during this monitoring period. All electronic data and paper documents were archived for two years following the end of the crediting period. The electricity meter was calibrated annually according to the industrial standard "Technical administrative code of electric energy metering (DL/T448-2016)"
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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)
Value applied:	99.5
Comments	The parameter was updated according to IPCC.

Data / Parameter	$TDL_{j,y}$
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Value applied:	20%
Comments	The parameter was updated according to Methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)

7.2 Baseline Emissions

7.2.1 Baseline emissions from methane destroyed

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 is 0, i.e., $BE_{MD,y} = 0$.

7.2.2 Baseline emissions from release of methane into the atmosphere

According to section 5.1, the amount of methane that would have been emitted to the atmosphere in the baseline scenario shall be determined as follows:

$$BE_{MR,y} = \sum_i \sum_s (MT_{PJ,s,i,y} - MT_{BL,s,i,y}) \times GWP_{CH_4}$$

In the baseline scenario, there is no CMM captured and destroyed, thus $MT_{BL,s,i,y}$ is 0;

Thus,

$$BE_{MR,y} = \sum_i \sum_s MT_{PJ,s,i,y} \times GWP_{CH_4}$$

Thus, the calculation result of $BE_{MR,y}$ is as the following table 7-1.

Table 7-1 Calculation of $BE_{MR,y}$

Year	$MT_{PJ,s,i,y}$	GWP_{CH_4}	$BE_{MR,y}$
	tCH ₄	tCO ₂ /tCH ₄	tCO ₂
01-December-2022 to 31-December-2022	1088.98	28	30,491
01-January-2023 to 31-December-2023	19795.94	28	554,286
01-January-2024 to 31-August-2024	17,104.18	28	478,917
Total			1,063,694

7.2.3 Baseline emissions from power generation replaced by the project

The baseline emissions from displacement of power or heat generation, or supply of vehicle fuels are given by the following equation:

$$BE_{use,y} = \sum_k (EG_{use,k,y} \times EF_{k,y})$$

As per section 5.1, since emission reductions will not be claimed in heat generation. And for the project is not involved emission reduction from supply of vehicle fuels, the equation can be simplified as followed:

$$BE_{use,y} = EG_{use,k,y} \times EF_{k,y} = EG_{PJ,grid,y} \times EF_{grid,CM,y}$$

The calculation result of $BE_{use,y}$ is as table 7-2.

Table 7-2 Calculation of $BE_{use,y}$

Year	$EG_{use,k,y}$ ($EG_{PJ,grid,y}$)	$EF_{k,y}$ ($EF_{grid,CM,y}$)	$BE_{use,y}$
	MWh	tCO ₂ /MWh	tCO ₂
01-December-2022 to 31-December-2022	5,122.88	0.63360	3,245
01-January-2023 to 31-December-2023	94,432.74	0.63360	59,832
01-January-2024 to 31-August-2024	84,785.99	0.63360	53,720
Total			116,797

According to the methodology ACM0008 (version 08.0), baseline emission is given by the following equation:

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

As a summary, the baseline emission is as table 7-3.

Table 7-3 Summary of baseline emission

Year	$BE_{MD,y}$	$BE_{MR,y}$	$BE_{use,y}$	BE_y
	tCO ₂	tCO ₂	tCO ₂	tCO ₂
01-December-2022 to 31-December-2022	0	30,491	3,245	33,736
01-January-2023 to 31-December-2023	0	554,286	59,832	614,118
01-January-2024 to 31-August-2024	0	478,917	53,720	532,637
Total	0	1,063,694	116,797	1,180,491

7.3 Project Emissions

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

As per section 5.2, $PE_{ME,y} = \sum EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$

Table 7-4 Calculation of $PE_{ME,y}$

Year	$EC_{PJ,j,y}$	$EF_{EF,j,y}$ ($EF_{grid,CM,y}$)	$TDL_{j,y}$	$PE_{ME,y}$
	MWh	tCO ₂ /MWh	%	tCO ₂
01-December-2022 to 31-December-2022	0.28	0.63360	20%	1
01-January-2023 to 31-December-2023	9.52	0.63360	20%	8
01-January-2024 to 31-August-2024	6.72	0.63360	20%	6
Total				15

7.3.2 Project emissions from destruction of captured methane

As per section 5.2, $PE_{MD,y} = MD_{ELEC,y} \times CEF_{CH_4} = MM_{ELEC,y} \times Eff_{ELEC,y} \times CEF_{CH_4}$

Thus, the calculation result of $PE_{MD,y}$ is as table 7-5.

Table 7-5 Calculation of $PE_{MD,y}$

Year	$MM_{ELEC,y}$	$Eff_{ELEC,y}$	$MD_{ELEC,y}$	CEF_{CH_4}	$PE_{MD,y}$
	tCH ₄	%	tCH ₄	tCO ₂ /tCH ₄	tCO ₂
01-December-2022 to 31-December-2022	1088.98	99.5	1083.54	2.75	2,980
01-January-2023 to 31-December-	19795.94	99.5	19696.96	2.75	54,167

2023					
01-January-2024 to 31-August-2024	17,104.18	99.5	17,018.66	2.75	46,802
Total					103,949

7.3.3 Project emissions from un-combusted methane

According to section 5.2 of the PD, $PE_{UM,y} = GWP_{CH_4} \times MM_{ELEC,y} \times (1 - Eff_{ELEC,y})$,

which is calculated as the following table.

Table 7-6 Calculation of $PE_{UM,y}$

Year	$MM_{ELEC,y}$	$Eff_{ELEC,y}$	GWP_{CH_4}	$PE_{UM,y}$
	tCH ₄	%	tCO ₂ /tCH ₄	tCO ₂
01-December-2022 to 31-December-2022	1088.98	99.5	28	153
01-January-2023 to 31-December-2023	19795.88	99.5	28	2772
01-January-2024 to 31-August-2024	17,104.18	99.5	28	2,395
Total				5,320

Hence, the project emissions are calculated by the formulation below:

Table 7-7 Summary of project emission

Year	$PE_{ME,y}$	$PE_{MD,y}$	$PE_{UM,y}$	PE_y
	tCH ₄	tCO ₂	tCO ₂	tCO ₂
01-December-2022 to 31-December-2022	1	2,980	153	3,134
01-January-2023 to 31-	8	54,167	2,772	56,947

December-2023				
01-January-2024 to 31-August-2024	6	46,802	2,395	49,203
Total	15	103,949	5,320	109,284

7.4 Leakage Emissions

As described in Section 5.3, $LE_y = 0$.

7.5 GHG Emission Reductions and Carbon Dioxide Removals

Based on calculations in Section 7.2 and Section 7.3, the net GHG emission reductions are calculated as follows:

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-December-2022 to 31-December-2022	33,736	3,134	0	30,602	0	30,602
01-January-2023 to 31-December-2023	614,118	56,947	0	557,171	0	557,171
01-January-2024 to 31-August-2024	532,637	49,203	0	483,434	0	483,434
Total	1,180,491	109,284	0	1,071,207	0	1,071,207

Ex ante emission reductions/removals and achieved emission reductions/removals for this monitoring period, along with the percentage difference and the justification for that difference are shown:

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
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01-December-2022 to 31-December-2022	69,070 (Year 2022: this period covers 31 days)	30,602	-55.69%	The reason is mainly due to the unstable performance of the generator, as well as the impact on the initial operation of the project and the insufficient supply of CMM.
01-January-2023 to 31-December-2023	813,242 (Year 2023: this period covers 365 days)	557,171	-31.49%	
01-January-2024 to 31-August-2024	543,647 (Year 2024: this period covers 244 days)	483,434	-11.08%	
Total	1,425,959(Total)	1,071,207	-24.88%	

The actual emission reductions of 1,071,207 tCO₂e achieved in this monitoring period is 24.88%⁵⁰ lower than the estimated emission reductions 1,425,959⁵¹ tCO₂e. The main reason was that in the monitoring period, the unstable performance of the generator, as well as the impact on the initial operation of the project and the insufficient supply of CMM.

⁵⁰ $(1,071,207 \text{ tCO}_2\text{e} - 1,425,959 \text{ tCO}_2\text{e}) / 1,425,959 \text{ tCO}_2\text{e} = -24.88\%$

⁵¹ As per the report, the annual emission reduction of the project is 813,242 tCO₂e, thus the estimated emission reduction in the monitoring period from 01-December-2022 to 31-August-2024 (covering 640 days) is 1,425,959 tCO₂e, ie. $1,425,959 \text{ tCO}_2\text{e} = 813,242 \text{ tCO}_2\text{e} * 640 \text{ days} / 365 \text{ days}$.

APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

Not Applicable. The Project Description does not involve commercially sensitive information.

APPENDIX 2: <SUPPORTING EVIDENCE>

Evidence for SDG 7: From project operation date onwards, electricity generation by the project in this monitoring period have been listed in below table.

Start Date	End Date	Electricity Generation (MWh)
01-December-2022	31-December-2022	5,122.88
01-January-2023	31-December-2023	94,432.74
01-January-2024	31-August-2024	84,785.99
Total		184,341.61

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

Start Date	End Date	ER (tCO ₂ e)
01-December-2022	31-December-2022	30,602
01-January-2023	31-December-2023	557,171
01-January-2024	31-August-2024	483,434
Total		1,071,207

Evidence for SDG 8: The employee payroll of the project has been submitted as a separate document to VVB due to confidentiality requirement of the project proponent.