SICHUAN FURONG COAL MINE METHANE UTILIZATION PROJECT

Document Prepared by Goldchina Consultancy International Co., Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Sichuan Furong Coal Mine Methane Utilization Project (the Project) is implemented by Sichuan Furong Group's Limited Industrial Company (hereinafter referred to as "Furong Group"). The primary objective of the project is to capture and use coal mine methane ("CMM") for power generation. This will displace electricity used from the Central China Power Grid ("CCPG") [1] for on-site use. CMM is extracted from three of Furong Group's mines, including Baijiao, Shanmushu, and Gongquan coal mines. CMM extracted from three coal mines is prioritized for residential use and the surplus amount is sent for power generation. While the small portion of residential and commercial usage of CMM in the baseline scenario remains unaffected by the Project and no emission reduction is claimed for this part of CMM utilization.

The project activity involves the installation of electricity generators with a combined capacity of 15MW for the generation of power using CMM. Four domestic generators each with a 500kW capacity were commissioned in Baijiao coal mine on 28/11/2007 and during 05/2012-06/2012, three domestic generators installed in Baijiao coal mine were moved to Gongquan coal mine, Two sets of 3.048MW gas generators were commissioned in Baijiao coal mine on 25/05/2009. A set of 3.048MW gas generator in Shanmushu coal mine area has been put into commission since 01/09/2013 and another 3.048MW gas generator has been put into commission at Shanmushu coal mine since 01/10/2015.Four domestic generators each with a 500kW capacity were commissioned in Gongquan coal mine on 15/05/2009; During 05/2012-06/2012, three domestic generators installed in Baijiao coal mine were moved to Gongquan coal mine.

Details about the generation capacity of the three coal mines, please refer to the table below.

Table 1-1 Generation capacity of the three coal mines

Coal mines	Practical Situation
Baijiao	6.596MW(3.048MW×2units+0.5MW) On 28/11/2007, four domestic generators each with a 500kW capacity were commissioned in Baijiao coal mine [a]; On 25/05/2009, two sets of 3.048MW gas generator manufactured by GE Jenbacher GmbH were commissioned in Baijiao coal mine.
Shanmushu	6.096MW(3.048MW×2units) One set of 3.048MW gas generator manufactured by GE Jenbacher GmbH has been installed in Shanmushu coal mine area and put into commission since 01 /09/2013; Another 3.048MW gas generator manufactured by GE Jenbacher GmbH has been installed in Shanmushu coal mine and put into commission since 01/10/2015.

[1] The on-site captive power plant was stopped on 11/04/2010 according to the local government requirements, so, the electricity generated by the project only displaced the electricity generated by CCPG after 11/04/2010.

Gongquan	3.50 MW(0.5MW×7units) On 15/05/2009, four domestic generators each with a 500kW capacity were commissioned in Gongquan coal mine. During 05/2012-06/2012, three domestic generators installed in Baijiao coal mine were moved to Gongquan coal mine
Total	16.192MW[b]

Note: [a] During 05/2012-06/2012, three domestic generators installed in Baijiao coal mine were moved to Gongquan coal mine.

[b]The total named capacity of the project activity will be 16.192MW, but two sets of 500kW domestic generators are used as back-up (one is in Baijiao coal mine and the other is in Gongquan coal mine), because the equipment failure of 500kW domestic generators is frequent, which was approved by local DRC. Thus the total actual capacity of the project activity is about 15MW.

Through the implementation of the project, it is estimated that an average annual volume of 15.6 million cubic meters of CH_4 will be combusted and destroyed, which, in the baseline scenario, would otherwise be released directly into the atmosphere. Furthermore, average annual 43,890 MWh electricity derived from CMM will be delivered to the Furong coal mines for self-use, which will displace electricity from the CCPG. Waste heat from the power generation process is recovered and utilized for coal miners. However, emission reductions will not be claimed for this component in order to be conservative. Consequently, through CMM combustion and displacement of fossil fuel-fired electricity from the CCPG, the project will reduce 2,829,543 tCO_2 equivalents of greenhouse gas emissions during the 10-year crediting period considering the 28 of GWP_{CH4}[2].

During the monitoring period (from 01/01/2018 to 15/04/2020), the monitoring activities were conducted strictly in accordance with the monitoring plan in the approve revised PDD. The project has operated without any accidental or emergency events that might impact the accuracy and/or implementation of monitoring activities.

Date of construction for the project (the CMM power plant in Baijiao Coal Mine start to construct): 30/08/2007

Commissioning start date for project (he first unit of the CMM power plant in Baijiao Coal Mine began to operate): 28/11/2007

continued operation periods for the project : 20yrs

The project was registered as a VCS project (VCS1446). The 10 year fixed crediting period started on 16/04/2010 and expired on15/04/2020.

[2] As per VCS Standard V4.3, for GHG emission reductions occurring on or before 31 December 2020, all ex-ante estimates and ex-post calculations may be converted to CO_2e using either the GWP values from the IPCC Fourth Assessment Report (AR4) or those from AR5. so, the GWP values from from AR5 was applied for the project.

During the monitoring period (01/01/2018 to 15/04/2020), the emission reduction achieved by the project in this monitoring period is 841,244 tCO_2e. The emission reductions in the monitoring period will be verified and issued under VCS rules.

1.2 Sectoral Scope and Project Type

This category would fall within sectoral scope 08: Mining/Mineral Production and 10: Fugitive Emission from Fuels (solid, oil and gas)

The project is not a grouped project.

1.3 Project Proponent

Organization name	**Sichuan Furong Group's Limited Industrial Company**
Contact person	Zhang Hongge
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1.4 Other Entities Involved in the Project

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Organization name	**Goldchina Consultancy International Co., Ltd.**
Role in the Project	Consultant
Contact person	Dr. Zheng Zhaoning
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1.5 Project Start Date

The operation starting date for the project was 18/11/2007.

1.6 Project Crediting Period

10 years fixed crediting period is adopted by the project activity. The project was registered as CDM project (CDM ref no.:2677).

The VCS project crediting period will be ended once the fixed CDM project crediting period expired. The 10 years fixed crediting period started on 16/04/2010 and expired on 15/04/2020.

1.7 Project Location

The proposed project is located in Furong coal mine of Xunchang town in Yibin city of southern Sichuan province, China. The Furong coal mine consists of three mines (Baijiao, Shanmushu, and Gongquan) now. It is located 5km from the center of Xunchang town, 50km from Yibin city, and at a coordinate of 104°39’~104°41’ east longitude and 28°25’ ~28°28’ north latitude.

The power generators have been installed at Baijiao, Shanmushu and Gongquan coal mines.

The geographic location of the project is shown in the figure below.

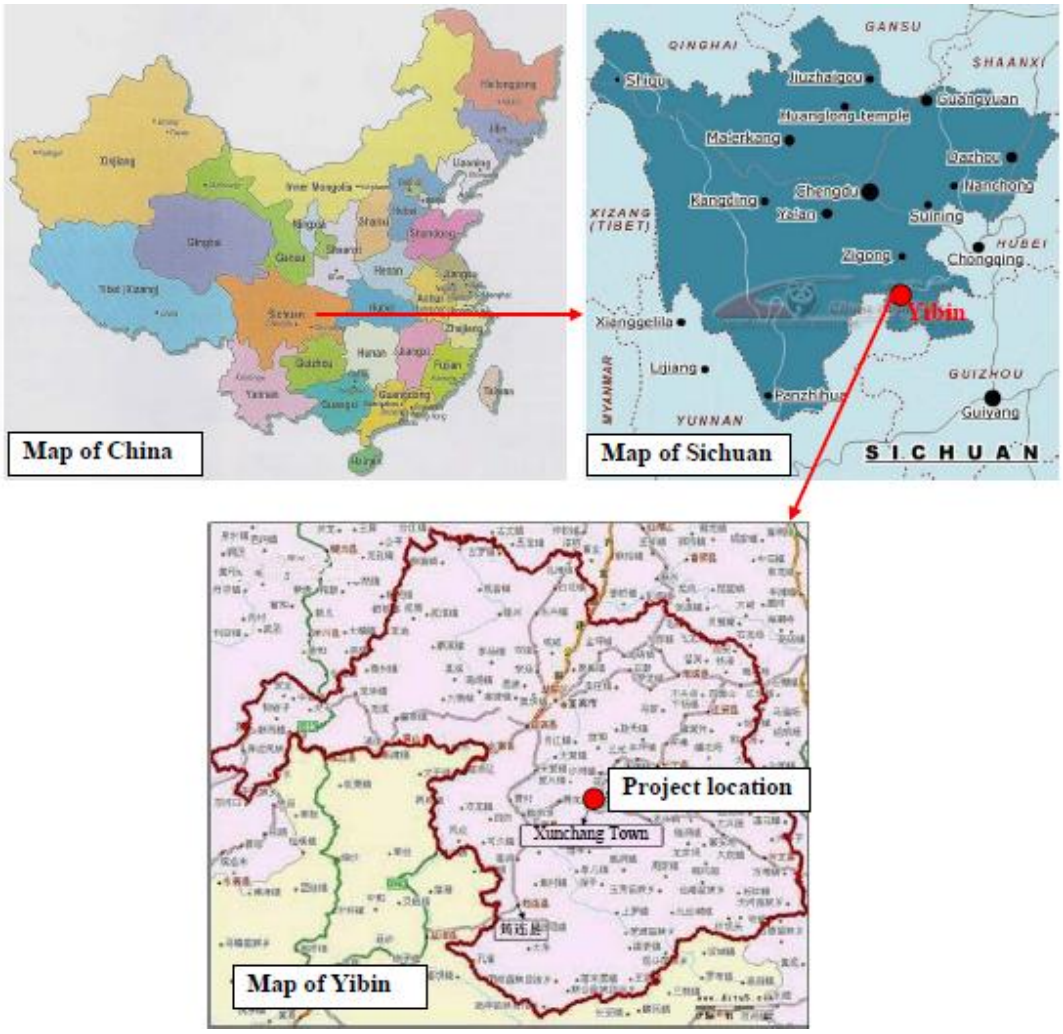


Fig.1-1 Project Location

1.8 Title and Reference of Methodology

ACM0008 Consolidated baseline methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction by flaring or catalytic oxidation (version 04).

Tool to calculate the emission factor for an electricity system (version 01.1)

Tool for the demonstration and assessment of additionality (version 05.2)

1.9 Participation under other GHG Programs

The project has been registered as a CDM project with registration number 2677 and VCS project (project ID: 1446).And no credit issued under CDM.

1.10 Other Forms of Credit

The project has not created any other form of environmental credit during this monitoring period, which will be verified by VVB.The project was registered as CDM project (CDM no.:2677) with the start date of the fixed crediting period, 16/04/2010, which is same as the start date of fixed crediting period for VCU issuance. As per CCER rule, those project registered under CDM only can issue carbon credits before the start date of the credting period of CDM project. The start date of the fixed crediting period of the Project under CDM and VCS 16/04/2010 and the fixed crediting period is 16/04/2010-15/04/2020, during the fixed crediting period, only CER or VCU can be issued. And the project owner submitted the letter of commitment for no-double counting that only VCUs be issued in the fixed crediting period (16/04/2010-15/04/2020). The project owner is a coal mine company in Sichuan Province, up to now(end of 05/2022) was not be included the Emission Trading Programs and Other Binding Limits in China .

Furthermore, the project owner submitted the letter of commitment for no-double counting that will not any forms of credit in the fixed crediting period (16/04/2010-15/04/2020).

1.11 Sustainable Development Contributions

The project activity will promote local sustainable development through the following aspects:

(1)provide clean and reliable electricity

(2)Create job opportunities during the project construction and operation periods;

(3)Promote CMM utilization by eliminating the release of methane into the atmosphere, which effectively reduce the greenhouse gas emission;

(4)Promote the technology transfer of advanced gas generator.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	*SDG Target number*	*Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator*	*Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)*	*Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.*	*Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.*
1)	7.1	7.1.2 Proportion of population with access to electricity	Implemented activities to increase	The project has provided 134052.7804 MWh electricity supply in this monitoring period	The project has provided 461514.3052MWh electricity supply during 16/04/2010-15/04/2020.
2)	8.5	8.5.1 Number of jobs created	Implemented activities to increase	No further changes this monitoring period	The project provided 43 employment opportunities. Among which, 7 persons are managers and engineers, 13 workers for Baijiao CMM power plant, 11 workers for gongquan CMM power plant and 12 workers for Shanmushu CMM power plant.

<table>
<tr>
<td>3)</td>
<td>13.0</td>
<td>Tonnes of greenhouse gas emissions avoided or removed</td>
<td>Implemented activities to increase</td>
<td>By recover and used CMM to produce electricity 841,244tCO_2e emission was reduced during the monitoring period</td>
<td>By recover and used CMM to produce electricity, 2792506t CO2 emission during 16/04/2010-15/04/2020 were reduced.
<table>
<tr><th>Monitoring period</th><th>Emission reductions(tCO_2e)</th></tr>
<tr><td>16/04/2010-31/12/2012</td><td>434379</td></tr>
<tr><td>01/01/2013-31/12/2017</td><td>1516883</td></tr>
<tr><td>01/01/2018-15/04/2020</td><td>841244</td></tr>
<tr><td>total</td><td>2792506</td></tr>
</table>
</td>
</tr>
<tr>
<td>4)</td>
<td>17.7.0</td>
<td>Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and</td>
<td>Implemented activities to increase</td>
<td>No further changes this monitoring period</td>
<td>4 set of advanced GE JMS620GS-S.L 3MW level gas generators are applied for combust CMM to produce electricity.</td>
</tr>
</table>

		preferential terms, as mutually agreed			

2 SAFEGUARDS

2.1 No Net Harm

There is no net harm.

The project owner commissioned the Environmental Science and Technology School of Southwest Jiaotong University to perform an environmental impact assessment of the proposed project. In the assessment, the proposed project has been considered to have few potential impacts on air, water quality,sound environment, etc. The Environmental Impact Assessment (EIA) Report was approved by Yibin Environmental Protection Bureau (EPB) on September 10th 2007.

In addition, the EIA report on the newly built 20,000 m^3 gas tank was completed by Chonqing Dehe Environmental Engineering Co., Ltd. in July 2007, and approved by Yibin EPB on August 29th 2007.

The results of this evaluation are summarized as follows.

Air Pollution

During the project construction period, the main air pollutant is particulates (dust) which are released from construction activities and transportation and the emission from vehicles and construction machinery. Measures will be taken to mitigate this pollutant, such as spraying water at construction sites and on dusty roads, controlling vehicle speeds and operating with proper maintenance and in compliance with relevant emission standards.

During the operation period, the main air pollutant is exhaust gas from gas generators, which containing mainly NOx. With the installation of modern equipment, the NOx emissions will be in compliance with Chinese standards and limits.

Wastewater

In the project activity, water will be used as a coolant for the gas generators. This coolant will be circulated in a closed circuit line, and between gas generators and the cooling tower also. Consequently, no effluent will be produced and discharged into the river system from the electricity generation component. Sewage will be treated on-site. After treatment, a portion of treated water will be reused for watering plants on site, and the remaining once having met the discharging standards will be discharged into the river.

Noise

The potential noise source will be gas generators. However, the generators will be housed indoors and the walls will be made of soundproof materials to reduce noise emissions. Through noise protection measures(such as mufflers on exhaust pipes and sound

insulation parts) it can be reduced to a level that meets regulation. In addition, since the gas generators are located in the existing captive power plant or the coal mine area, which is away from any residence, noise have no impact on local residents. Operators will work in the control room outside of the generator house, and they will be protected with ear plugs, if necessary.

Waste

The main forms of solid waste from the proposed project include: refuse generated on the construction site and waste generated by construction workers in the construction period, and by operators in the operation period. These solid wastes will be disposed of in a local landfill.

Gas storage tank

The main environmental impact related to the gas tank is the noise caused by blowers. The following measures will be taken to mitigate the gas tank noise.

Adopting low noise equipment;

Constructing soundproof walls and mufflers;

Applying soft connections between pipes and vibrating equipment;

Planting trees around the gas tank area.

In addition, many protective measures are undertaken in order to prevent leakage or the occurrence of explosions. These measures include, but are not limited to:

Installing gas leakage detector on the tank;

Equipping with automatic cut-out system for emergencies at the inlet and outlet of storage tank and blowers;

Installing fire-resistance wall and explosion-proof equipment and devices;

Maintaining and inspecting storage tank and all relevant parts on a regular basis;

Establishing safety management and operation policies and measures, e.g. Duties for Control Entry to Storage Tank Area, Duties for Routine Inspection, Duties for Maintenance and Repair,

The project has no negative potential impact on the local people and environment.

The EIA report on the project and individual EIA report on the gas tank were approved by Yibin Environmental Protection Bureau on September 10th 2007 and August 29th 2007, respectively. Strict environmental monitoring and mitigation measures was carried out during the construction and operation phases. The project will not cause any significant environmental impacts. On the contrary, the project will bring a positive impact on the local

environment. By implementing the proposed project, electricity generated by coal-fired captive power plant and from the thermal-power-dominated CCPG will be displaced. Thus, emissions of dust, sulphur oxides and nitrogen oxides, etc. that would be produced by the CCPG will be avoided.

The project recover and utilize the vented CMM to generate electcity, which create new benefits for the project owner and improve the coal mine safety, so the project has no negative socio-economic impacts.

2.2 Local Stakeholder Consultation

A stakeholder consultation has been carried out. The project owner sent letters to key local stakeholders and leading residents in Xunchang town to attend the stakeholder consultation of the proposed project. In the letter they enclosed papers explaining the aim and outline of the proposed project. And they televised the project concept and information to the local residents and announced the date of the stakeholder consultation through a local TV channel.Meanwhile, they posted public announcements on village billboards two weeks before the stakeholder consultation.

The Furong area stakeholder consultation was held on January 11th 2007. Twenty-two people participated, who were representatives of local villagers, local council workers, related local government organizations and project staff.

At the consultation, the project manager explained the project's mission and outline. Participants asked questions on the project and Furong project staffs provided responses accordingly as follow:

Almost all stakeholders who were present during the consultation understood the significant aim of this project, which is to reduce GHG and to use CMM for residential fuel and power generation. Some stakeholders asked or brought up the following questions or concerns, and project manager answered accordingly.

Q1. We are concerned that if the CMM extracted is converted into electricity, there will be a shortage of residential gas supply.

A1. The principle of the CMM project is to give high priority to residential use. We will make sure that the residential gas will never be in short supply after the project begins operation.

Q2. Recently shortage of household gas fuel has been occurred especially in winter. In the proposed project, CMM will be used for gas generator too. We are very concerned about more frequent occurrences of gas shortage.

A2. In the proposed project, the existing gas grid will be restructured on a massive scale. A new gas storage tank which has 20,000 cubic meter capacity will be installed at Shanmushu coal mine. Only a part of Shanmushu CMM could be used by the gas grid up

to now, but after the new storage tank is installed we can fully use the CMM of Shanmushu. So residential gas will be supplied sufficiently. Even in winter, residents can use plenty of gas, more than before.

Q3. How will you reduce the noise pollution from the gas power plant?

A3. All gas generators will be installed in houses that will be constructed with sound proof materials. Also, exhaust pipe noise protection measures (such as muffler/silencer) will be installed. It can be reduced to a level that meets regulation. Therefore, outside of the house the noise level will be lower than relevant Chinese regulation. Also the gas generators are located away from residential streets, schools, and sensitive receptors. It is expected that the project will have few acoustic impacts on the existing amenity.

Q4. Is there any concern over the environmental impact after the operation of the gas power plant?

A4. There is little toxic material contained in the exhaust gas and wastewater of the project. Moreover the electricity from gas generators will displace the electricity from the captive power plant and the CCPG, so SOx and NOx and dust will be lower than present level.

Q5. Is it possible to use CMM from the nearby small coal mines under this proposed project?

A5. It would be possible theoretically, but we did not consider this possibility due to limited time on the project construction. Currently, there is another methodology for small-scale CDM that is available to small coal mines, which can be easily developed as a CDM project.

At the end of the meeting, all participants unanimously agreed to implement the project.

During project implementation phase, there is a public comments collection and feedback book for each power plant. The local stakeholders can leave their opinions, comments and concerns on the project and contact information in the public comments collection and feedback book at any time. The project owner will contact the local stakeholder to give feedback within one week. So far, no public comments about potential negative impacts during project implementation have been received by the project owner.

2.3 AFOLU-Specific Safeguards

The project is not AFOLU projects.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Four domestic generators each with a 500kW capacity were commissioned in Baijiao coal mine on 28/11/2007 and during 05/2012-06/2012, three domestic generators installed in Baijiao coal mine were moved to Gongquan coal mine. Two sets of 3.048MW gas generators were commissioned in Baijiao coal mine on 25/05/2009. A set of 3.048MW gas generator in Shanmushu coal mine area has been put into commission since 01/09/2013 and another 3.048MW gas generator has been put into commission at Shanmushu coal mine since 01/10/2015.

500kW domestic generators are easily moved, so, it is the project owner's arrangement that 500kW domestic generators will be used to balance the CMM extraction fluctuation for three coal mines. So, the location of 500kW domestic generators is flexible.

Eight domestic generators each with a 500kW capacity and four imported generators each with a 3048kW capacity have already been installed at the project site. Please refer to Table 3-1 and 3-2 below for the technical parameters of the already installed generators.

Table 3-1 Technical parameters of 3.048MW gas generators

Parameter	Value
	Imported Units
Model	JMS620GS-S.L
Rated power	3048 kW
Power factor	1
Rated voltage	6300 V
Rate speed	1500
Weight	22200 kg
Technical lifetime	20years
Amount	4
Location	2 at Baijiao coal mine, 2 at Shanmushu coal mine

Table 3-2 Technical parameters of 500KW gas generators

Parameter	Value
Model	500GF1-2RW
Rated Power	500 kW
Power factor	0.8

Rated voltage	400V
Rate Speed	1000r/min
Weight	13350kg
Technical lifetime	>20 years
Amount	8
Location	7 sets at Gongquan coal mine and 1 set at Baijiao coal mine.
Remark	Among the 8 sets gas generators, 2 sets will be used as back-up for hardware replacement, by now, one is at Baijiao coal mine and the other one is at Gongquan coal mine.

Eight waste heat boilers for 500KW gas generators were installed . The specifications of these waste heat boilers are shown in the Table 3-3 below.

Table 3-3 Technical parameters of waste heat boilers for 500KW gas generators

Model	Q2/500-0.28-5.5/120/60	Q2/500-0.28-1.0/120
location	Baijiao, Gongquan	Gongquan
Rated heat output	0.28 MW	0.28 MW
Rated outflow pressure	5.5 Mpa	1.0 Mpa
Rated outflow temperature	115 ℃	120 ℃
Backwater temperature	60 ℃	60 ℃

Two waste heat boilers for 3.048MW gas generators were installed at Baijiao and two waste heat boilers for 3.048MW gas generators were installed at Shanmushu. The specifications of these waste heat boilers are shown in the table below.

Table 3-4 Technical parameters of waste heat boilers for 3048KW gas generator

Items	Baijiao	Shanmushu
Model	QC12/500-2.4-1.0-200	Q12.4/493-1.75-0.8
Rated heat output	2.4t/h	1.75t/h
Rated outflow pressure	1.0Mpa	0.8Mpa
Rated outflow temperature	200℃	175℃
Backwater temperature	10℃	20℃

The post – registration change was included in the revised registered PDD version 08 dated 28/08/2013 and approved by EB on 18/12/2013.

The project was implemented as described in the revised registered PDD version 08 dated 28/08/2013. During this monitoring period,from 01/01/2018 to 15/04/2020 the project had a smooth operation and the monitoring system worked properly, no special events occurred

.Table3-5 implementation status of the project

Location	Installed capacity	Model	Waste heat boiler	Date put into operation
Baijiao power plant	0.5 MW (1* 0.5MW)	500GF1-2RW	Q2/500/0.28-5.5-115/60	28/11/2007
	6.096MW (2*3.048MW)	JMS620GS-S.L	QC12/500-2.4-1.0-200	25/05/2009
Shanmushu power plant	3.048MW	JMS620GS-S.L	Q12.4/493-1.75-0.8	01/09/2013
	3.048MW	JMS620GS-S.L	Q12.4/493-1.75-0.8	01/10/2015
Gongquan power plant	3.5MW(7*0.5MW)	500GF1-2RW	Q2/500/0.28-1.0/120/60r	15/05/2009

3.2 Deviations

2.1.1 Methodology Deviations

There is no deviation applied to this monitoring period.

2.1.2 Project Description Deviations

There is no deviation applied to this monitoring period.

The post –registration change was included in the revised registered PDD version 08 dated 28/08/2013 and approved by EB on18/12/2013.

The project was implemented as described in the revised registered PDD version 08 dated 28/08/2013

3.3 Grouped Projects

The project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Eff_{ELEC}
Data unit	-
Description	Efficiency of methane destruction in power plant
Source of data	IPCC
Value applied	99.5%
Justification of choice of data or description of measurement methods and procedures applied	IPCC is the reliable source.
Purpose of Data	Calculation of project emissions
Comments	

Data / Parameter	GWP_{CH4}
Data unit	tCO_2e/CH_4
Description	Global warming potential of methane
Source of data	IPCC
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	AR5 of IPCC is the reliable source.
Purpose of Data	Calculation of baseline, project and leakage emissions
Comments	-

Data / Parameter	CEF_{CH4}

Data unit	tCO_2e/tCH_4
Description	Carbon emission factor for combusted methane
Source of data	Methodology ACM0008 (ver 04)
Value applied	2.75
Justification of choice of data or description of measurement methods and procedures applied	ACM0008 is the reliable source.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	D_{CH4}
Data unit	tCH_4/m^3
Description	Density of methane under normal conditions (20℃ and 101.325kPa) in the exhaust gases.
Source of data	IPCC default value
Value applied	0.00067
Justification of choice of data or description of measurement methods and procedures applied	IPCC is the reliable source.
Purpose of Data	Calculation of baseline, project and leakage emissions
Comments	-

Data / Parameter	CEF_{ELEC}
Data unit	tCO_2e/MWh
Description	Because the on-site captive plant was closed as per the government requirement, only considering the electricity from the CCPG is displaced. So the CEF_{ELEC} will be CCPG emissions factor, this is conservative.
Source of data	The approved revised PDD
Value applied	0.9745
Justification of choice of data or description	The data is ex ante determined in the approved revised PDD.

of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Determined ex-ante and fixed for the fixed crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$CONS_{ELEC,PJ}$
Data unit	MWh
Description	Additional electric power consumption by the project in year y
Source of data	On-site continuous measurements by electricity meters
Description of measurement methods and procedures to be applied	On-site electricity meters.
Frequency of monitoring/recording	Continuously monitored by on-site electricity meters. The data will be daily recorded.
Value monitored	4,915.4276
Monitoring equipment	

	Baijiao	Shanmushu	Gongquan
Type	Electricity meter	Electricity meter	Electricity meter
Accuracy class	0.5s/0.5	0.5	0.5s
Serial number	0045641220/ 45386238	13442301/ 13442265	45386237
Calibration frequency	yearly	yearly	yearly
Date of previous calibration	10/12/2017 05/12/2018 01/12/2019	10/12/2017 05/12/2018 01/12/2019	10/12/2017 05/12/2018 01/12/2019
Validity	yes	yes	yes

QA/QC procedures to be applied	Electricity meters were maintained and calibrated for accuracy (0.5) according to manufacturer's specifications and relevant national or sectoral regulations. The calibration will be carried out annually by

	an independent certified party.
Purpose of the data	Calculation of project emissions
Calculation method	*N/A*
Comments	The original data and calculation process please refer to the ER calculation sheet

Data / Parameter	MM_{ELEC}
Data unit	tCH_4
Description	Methane (including pre-mining CMM and post mining CMM) sent to CMM power plant(minus the vented methane)
Source of data	Automatically calculated by the installed monitoring system with monitored data by gas flow meters (installed at the inlet pipeline and the pipeline emergency vent valve located) and methane concentration meters (installed at the inlet pipeline).
Description of measurement methods and procedures to be applied	Measured
Frequency of monitoring/recording	Continuously measured. The monitored data will be daily recorded.
Value monitored	28,284.43
Monitoring equipment	Automatically calculated by the installed monitoring system with monitored data by gas flow meters (installed at the inlet pipeline and the pipeline emergency vent valve located) and methane concentration meters (installed at the inlet pipeline).

meter	Gas flow meter			methane concentration meter		
mine	Baijiao	Gongquan	Shanmushu	Baijiao	Gongquan	Shanmushu
Type	Gas flow meter	Gas flow meter	Gas flow meter	methane concentration meter	methane concentration meter	methane concentration meter
Accuracy class	0.5	0.5	0.5	0.5	0.5	0.5
Serial number	120894	1528	09005/ 09001	1101	1243	1414
Calibration frequency	yearly	yearly	yearly	yearly	yearly	yearly

	Date of last calibration	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019
	Validity	yes	yes	yes	yes	yes	yes
QA/QC procedures to be applied	Monitoring instruments are maintained and calibrated according to manufacturer's specifications and relevant national or sectoral regulations. The calibration is carried out by an independent certified party annually.						
Purpose of the data	Calculation of baseline and project emissions						
Calculation method	The methane in volume sent to CMM power plant is equal to the CMM from the pumps subtract the vented CMM. But the readings of gas flow meters which were installed at the emergency vent valves are zero, which means that the emergency evacuation valves before the gas generators were not used, so no CMM was vented during the monitoring period.						
Comments	The original data and calculation process please refer to the ER calculation sheet. Some backup meters are calibrated and waiting for replacement once gas flow meters and methane concentration meters be malfunctioned.						

Data / Parameter	PC_{CH4}
Data unit	%
Description	Concentration (in volume) of methane in extracted gas (%), measured on wet basis
Source of data	Measured by the on-site infrared methane concentration meters, optical.
Description of measurement methods and procedures to be applied	Measured
Frequency of monitoring/recording	Continuously measured
Value monitored	34.15 (average)
Monitoring equipment	Methane concentration can be measured real-time by infrared methane concentration meters mounted on the gas pipelines using nondispersive infrared gas analysis technique. The monitored data will be recorded daily.

	The continuously monitored methane concentration meter with accuracy of 0.5 will be installed.

mine	Baijiao	Gongquan	shanmushu
Type	methane concentration meter	methane concentration meter	methane concentration meter
Accuracy class	0.5	0.5	0.5
Serial number	1101	11243	1414
Calibration frequency	yearly	yearly	yearly
Date of last calibration	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019	19/06/2017 19/06/2018 19/06/2019
Validity	yes	yes	yes

QA/QC procedures to be applied	Monitoring instruments are maintained and calibrated according to manufacturer's specifications. The calibration is carried out by an independent certified party annually.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	Some backup meters are calibrated and waiting for replacement once gas flow meters and methane concentration meters be malfunctioned.

Data / Parameter	PC_{NMHC}
Data unit	%
Description	Concentration (in volume) of NMHC in extracted gas
Source of data	Analyzed by Sichuan Quality Supervision and Inspection Institute for Gaseous Product, a nationally certified entity. Measured by hydrogen flame ionization detector using gas phase chromatography, optical.
Description of measurement methods and procedures to be applied	Measured
Frequency of monitoring/recording	at least once a year

Value monitored	<table><tr><th>Year</th><th>Baijiao CMM power plant</th><th>Gongquan CMM power plant</th><th>Shanmushu CMM power plant</th></tr><tr><td>2018</td><td>0.015%</td><td>0.016%</td><td>0.014%</td></tr><tr><td>2019</td><td>0.015%</td><td>0.016%</td><td>0.015%</td></tr><tr><td>2020</td><td>0.015%</td><td>0.015%</td><td>0.016%</td></tr></table>
Monitoring equipment	*Annual qualified lab analysis with hydrogen flame ionization detector using gas phase chromatography.* *The lab must be qualified and certified by relevant authorities according to local or national regulations.*
QA/QC procedures to be applied	*The test will be carried out at least once a year in accordance with national standards*
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	CO_2 emissions from the combustion of non methane hydrocarbons (NMHCs), if they represent more than 1% by volume of the extracted coal mine gas; if PC_{NMHC} <1%, CO_2 emissions from NMHC destruction can be ignored.

Data / Parameter	CEF_{NMHC}
Data unit	-
Description	Carbon emission factor for combusted non methane hydrocarbons (various)
Source of data	Will be analyzed by the same qualified institute.
Description of measurement methods and procedures to be applied	To be monitored.
Frequency of monitoring/recording	at least once a year
Value monitored	-
Monitoring equipment	Analyzed by Sichuan Quality Supervision and Inspection Institute for Gaseous Product, a nationally certified entity The lab must be qualified and certified by relevant authorities according to local or national regulations.
QA/QC procedures to be applied	*The test will be carried out at least once a year in accordance with national standards.*

Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	if PC_{NMHC} <1%, CO_2 emissiona from NMHC destruction can be ignored.

Data / Parameter	GEN_y
Data unit	MWh
Description	Electricity generated by gas generators
Source of data	Continuous on-site measurement by electricity meters
Description of measurement methods and procedures to be applied	Electricity meters were installed at gas power plants to measure the electricity delivered to the on-site electric grid for Furong self-use.
Frequency of monitoring/recording	Continuously measured
Value monitored	138968.2080
Monitoring equipment	
QA/QC procedures to be applied	Monitoring instruments will be maintained and calibrated for accuracy (0.5) according to manufacturer's specifications. The calibration will be carried out annually by an independent certified party.

	Baijiao	Gongquan	Shanmushu
Type	Electricity meter	Electricity meter	Electricity meter
Accuracy class	0.5/0.5/0.2	0.5	0.5S
Serial number	2510034/13260114/1005031770071	13260124	190970070
Calibration frequency	yearly	yearly	year
Date of last calibration	01/04/2017 25/03/2018 20/03/2019 15/03/2020	01/04/2017 25/03/2018 20/03/2019 15/03/2020	01/04/2017 25/03/2018 20/03/2019 15/03/2020
Validity	yes	yes	yes

Purpose of the data	Calculation of baseline emissions
Calculation method	N/A
Comments	The original data and calculation process please refer to the ER calculation sheet.

4.3 Monitoring Plan

Data Collection Procedures

CMM flow, temperature and pressure are continuously measured by the flow meters installed. Methane concentration is continuously measured by the methane concentration meters installed. The monitored data is recorded automatically and aggregated hourly, daily, monthly and yearly by the monitoring system.

Electricity generated and additional electric power consumption by the project are continuously measured by the electricity meters installed at the CMM power plant and installed at the CMM pump house. The monitored data will be daily recorded and aggregated monthly and yearly.

Additional electric power consumption by the project is continuously measured by the electricity meters installed at the pump station. And the monitored data will be daily recorded and aggregated monthly and yearly.

The other parameters, such as NMHC in the CMM are measured annually by a qualified institute.

Collected data is archived in electronic spreadsheet and checked by directors of Monitoring System. The electronic documents are stored on hard disk. In addition, a hard copy printout is archived in a designated documents storage room.

The main monitoring instruments and installation points are shown in Fig. 4-1 below.

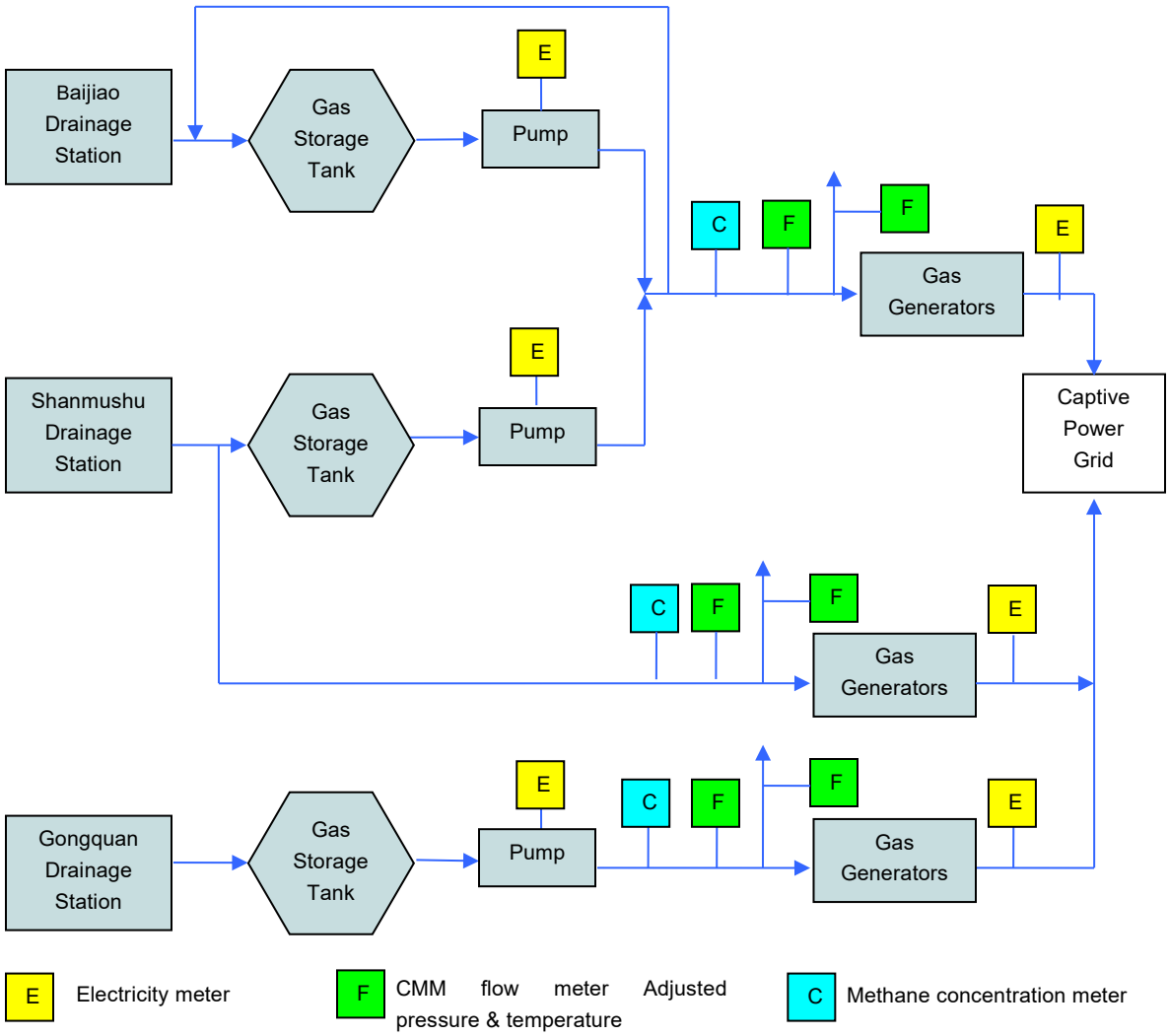


Fig.4-1 Monitoring Instruments and Installation

CMM flow meters, methane concentration meters (temperature and pressure can be monitored simultaneously) and a modern display cabinet was supplied by CQCCRI, which is responsible for the instrument installation and will provided the training for the operation and maintenance of these instruments by the operating staff.

The accuracy and applicable standards of these meters are shown in the Table 4-1 below.

Table 4-1 Main Monitoring Instruments

Symbol	Instrument	Function	Applied Standards	Model	Accuracy
C	Methane concentration meter	Measuring CH_4 concentration of the drained CMM sent to the gas generators	JJG 1138-2017	GJG100H(B) Infra red	0.5
F	Gas flow meter	Measuring the CMM volume sent to the gas generators	JJG640-2016	GLY series	0.5
E	Electricity meter	Measuring electricity delivered by the project	JJG 307-2006 JJG 596-2012	N/A	0.2/0.5(s)

2. Monitoring Organization

The structure of the VER team is shown as follows.

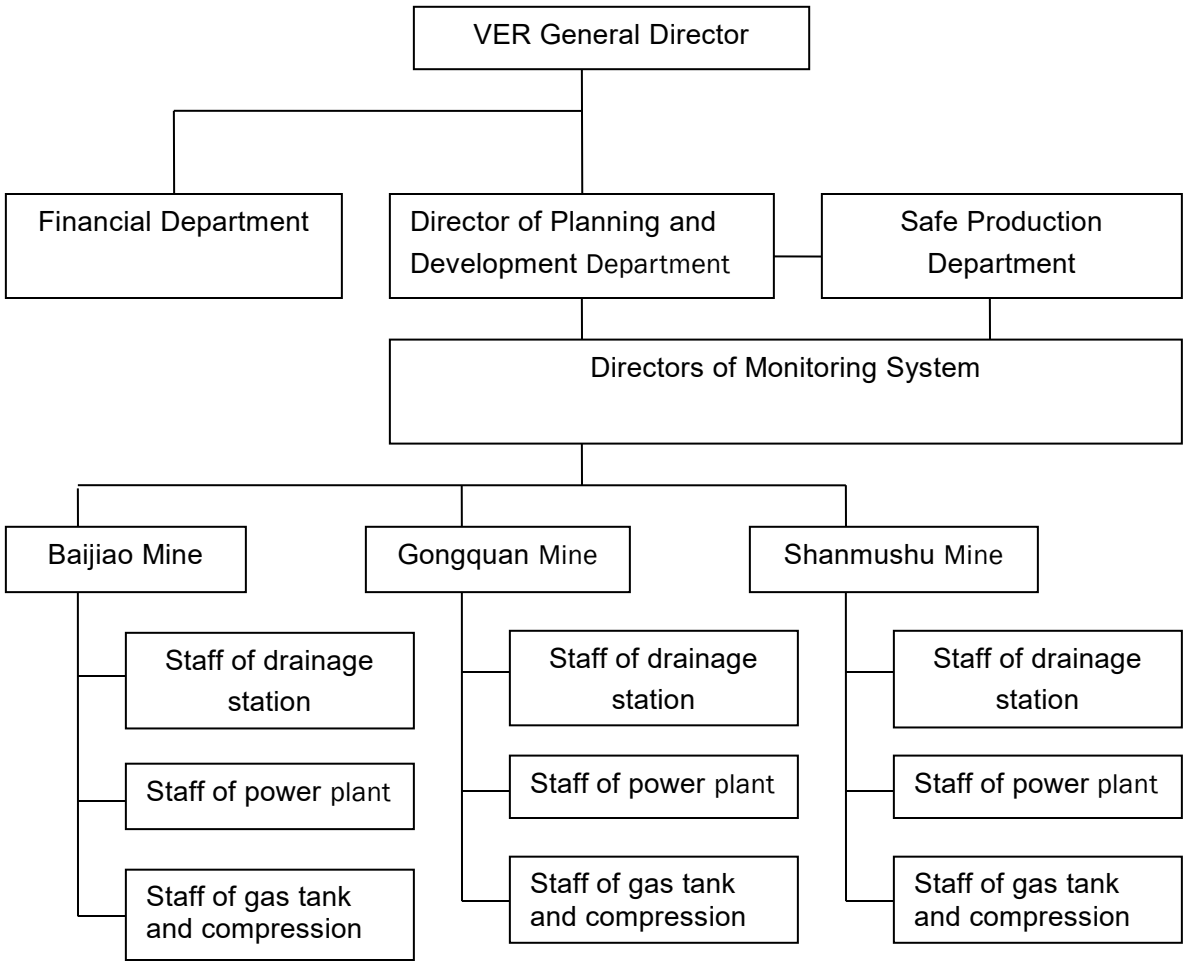


Fig. 4-2 Furong Group VER Team

All other monitoring staff have clearly defined roles and responsibilities to ensure the accurate implementation of the monitoring plan, including:

(1) Directors of Monitoring System

- ✓ Provide training for the monitoring staff to ensure high quality of monitoring activities.
- ✓ Calculate ERs using collected data.
- ✓ Compiling periodical monitoring reports for verification of VERs.
- ✓ Reporting to the Director of Planning and Development Department with any issues related to project's performance.

(2) Monitoring staff

- ✓ Collect and store monitoring data in a safe manner.
- ✓ Maintain monitoring system and equipment under their normal operating conditions.
- ✓ Calibrate monitoring devices and instruments in accordance with the manufacturer's specifications and national or sectoral standards and requirements.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The project activity includes supplying CMM to power plant, no other technologies such as flaring, catalytic oxidation, etc., are being applied. Although the CMM directly used for heat generation is not included in the project activity, it will be monitored if any CMM destroyed through heat generation occurs in the crediting period. In addition, CMM supplied to gas grid or vehicle use will be monitored too. If the overlap occurs between CMM used for power generation and baseline use of CMM for households and vehicles, it will be used for calculating the project emissions. If total annual CMM volumes are more than enough to cover annual thermal energy and power requirements, no project emissions will be accounted for. Therefore, the formula is expressed as follows:

Baseline emissions are given by the following equation:

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

Where:

BE_y Baseline emissions in year y (tCO_2e)

$BE_{MD,y}$ Baseline emissions from destruction of methane in the baseline scenario in year y (tCO_2e)

$BE_{MR,y}$ Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO_2e)

$BE_{Use,y}$ Baseline emissions from the production of power and supply to gas grid replaced by the project activity in year y (tCO_2e)

5.1.1 Methane destruction in the baseline

In the baseline scenario, a small portion of the extracted CMM is utilized by residential users through the gas grid. Emission reduction from this part is not considered and methane destruction in the baseline is set to zero. This is conservative.

5.1.2 Methane released into the atmosphere

$$BE_{MR,y} = GWP_{CH4} \times MM_{ELEC}$$

Where:

GWP_{CH4} Global warming potential of methane (28tCO_2e/tCH_4)

MM_{ELEC} Methane measured sent to power plant (tCH_4)

For the pre-mining CMM and post-mining CMM in the Project, there is a common drainage system and it is impossible to install separated systems, so, MM_{ELEC} includes the pre-mining CMM and post-mining CMM.

Table 5-1 Methane sent to Baijiao CMM power plant, under baseline scenario would be released into the atmosphere

Year	MM_{ELEC} (m^3)	MM_{ELEC} (tCH_4)	$BE_{MR,y}$ (tCO_2e)
	A	B=A* $Density_{CH4}$	C=B* GWP_{CH4}
01/01/2018-31/01/2018	553114	370.59	10,376
01/02/2018-28/02/2018	413096.46	276.77	7,750
01/03/2018-31/03/2018	733392.03	491.37	13,758
01/04/2018-30/04/2018	864371.56	579.13	16,216
01/05/2018-31/05/2018	555677.97	372.30	10,425
01/06/2018-30/06/2018	640767.39	429.31	12,021
01/07/2018-31/07/2018	439391.95	294.39	8,243
01/08/2018-31/08/2018	592332.58	396.86	11,112
01/09/2018-30/09/2018	431064.51	288.81	8,087

01/10/2018-31/10/2018	764523.11	512.23	14,342
01/11/2018-30/11/2018	732869.94	491.02	13,749
01/12/2018-31/12/2018	683345.28	457.84	12,820
01/01/2019-31/01/2019	716473.79	480.04	13,441
01/02/2019-28/02/2019	665979.16	446.21	12,494
01/03/2019-31/03/2019	462754.31	310.05	8,681
01/04/2019-30/04/2019	401141.27	268.76	7,525
01/05/2019-31/05/2019	671278.07	449.76	12,593
01/06/2019-30/06/2019	551768.99	369.69	10,351
01/07/2019-31/07/2019	628622.83	421.18	11,793
01/08/2019-31/08/2019	708603.93	474.76	13,293
01/09/2019-30/09/2019	552739.52	370.34	10,369
01/10/2019-31/10/2019	528009.81	353.77	9,905
01/11/2019-30/11/2019	505874.59	338.94	9,490
01/12/2019-31/12/2019	715161.73	479.16	13,416
01/01/2020-31/01/2020	582593.37	390.34	10,929
01/02/2020-29/02/2020	528141.24	353.85	9,908
01/03/2020-31/03/2020	677271.74	453.77	12,706
01/04/2020-15/04/2020	289645.52	194.06	5,434
Total	16,590,006.65	11,115.30	311,229

Table 5-2 Methane sent to Gongquan CMM power plant, under baseline scenario would be released into the atmosphere

Year	MM_{ELEC} (m^3)	MM_{ELEC} (tCH_4)	$BE_{MR,y}$ (tCO_2e)
	A	B=A* $Density_{CH4}$	C=B* GWP_{CH4}
01/01/2018-31/01/2018	397936.69	266.62	7,465
01/02/2018-28/02/2018	335541.41	224.81	6,295

01/03/2018-31/03/2018	518327.52	347.28	9,724
01/04/2018-30/04/2018	414562.89	277.76	7,777
01/05/2018-31/05/2018	439522.76	294.48	8,245
01/06/2018-30/06/2018	332616.92	222.85	6,240
01/07/2018-31/07/2018	352417.95	236.12	6,611
01/08/2018-31/08/2018	385537.02	258.31	7,233
01/09/2018-30/09/2018	582261.85	390.12	10,923
01/10/2018-31/10/2018	396534.39	265.68	7,439
01/11/2018-30/11/2018	260954.85	174.84	4,896
01/12/2018-31/12/2018	411228.5	275.52	7,715
01/01/2019-31/01/2019	444093.24	297.54	8,331
01/02/2019-28/02/2019	406443.47	272.32	7,625
01/03/2019-31/03/2019	374708.68	251.05	7,030
01/04/2019-30/04/2019	450780.22	302.02	8,457
01/05/2019-31/05/2019	370794.57	248.43	6,956
01/06/2019-30/06/2019	303217.82	203.16	5,688
01/07/2019-31/07/2019	338282.51	226.65	6,346
01/08/2019-31/08/2019	312450.24	209.34	5,862
01/09/2019-30/09/2019	406441.98	272.32	7,625
01/10/2019-31/10/2019	244001.65	163.48	4,577
01/11/2019-30/11/2019	341746.68	228.97	6,411
01/12/2019-31/12/2019	367254.72	246.06	6,890
01/01/2020-31/01/2020	320628.91	214.82	6,015
01/02/2020-29/02/2020	241099.27	161.54	4,523
01/03/2020-31/03/2020	281291.14	188.47	5,277
01/04/2020-15/04/2020	149860.9	100.41	2,811
Total	10,180,538.75	6820.96	190,987

Table 5-3 Methane sent to Shanmushu CMM power plant, under baseline scenario would be released into the atmosphere

Year	MM_{ELEC} (m^3)	MM_{ELEC} (tCH_4)	$BE_{MR,y}$ (tCO_2e)
	A	B=A* $Density_{CH4}$	C=B* GWP_{CH4}
01/01/2018-31/01/2018	683570.83	457.99	12,824
01/02/2018-28/02/2018	475488.59	318.58	8,920
01/03/2018-31/03/2018	504297.38	337.88	9,461
01/04/2018-30/04/2018	672689.38	450.70	12,620
01/05/2018-31/05/2018	474255.14	317.75	8,897
01/06/2018-30/06/2018	524269.22	351.26	9,835
01/07/2018-31/07/2018	586567.16	393.00	11,004
01/08/2018-31/08/2018	607214.87	406.83	11,391
01/09/2018-30/09/2018	618890.45	414.66	11,610
01/10/2018-31/10/2018	669952.13	448.87	12,568
01/11/2018-30/11/2018	617167	413.50	11,578
01/12/2018-31/12/2018	543632.78	364.23	10,199
01/01/2019-31/01/2019	696919.18	466.94	13,074
01/02/2019-28/02/2019	559921.15	375.15	10,504
01/03/2019-31/03/2019	678315.97	454.47	12,725
01/04/2019-30/04/2019	512492.26	343.37	9,614
01/05/2019-31/05/2019	751951.56	503.81	14,107
01/06/2019-30/06/2019	518000.56	347.06	9,718
01/07/2019-31/07/2019	636023.66	426.14	11,932
01/08/2019-31/08/2019	618265.28	414.24	11,599
01/09/2019-30/09/2019	526550.27	352.79	9,878
01/10/2019-31/10/2019	498484.93	333.98	9,352
01/11/2019-30/11/2019	728363.84	488.00	13,664

01/12/2019-31/12/2019	232633.06	155.86	4,364
01/01/2020-31/01/2020	96952.97	64.96	1,819
01/02/2020-29/02/2020	586719.23	393.10	11,007
01/03/2020-31/03/2020	576141.93	386.02	10,808
01/04/2020-15/04/2020	249293.16	167.03	4,677
Total	15,445,023.94	10,348.17	289,749

5.1.3 Emissions from power and heat generation replaced by the project

$$BE_{Use,y} = GEN_y \times CEF_{ELEC}$$

Where:

GEN_y Electricity generated by project activity in year y (MWh)

CEF_{ELEC} Carbon emissions factor of electricity used by Furong coal mines

The electricity generated by the project will displace the electricity from both the on-site captive plant and the CCPG in the baseline scenario. Because the on-site captive plant was closed as per the government requirement, only considering the electricity from the CCPG is displaced. So the CEF_{ELEC} will be CCPG emissions factor, this is conservative.

Table 5-4 Emissions from electricity displaced by Baijiao CMM power plant

Year	GEN_y (MWh)	$BE_{Use,y}$ (tCO_2e)
	D	E=D* CEF_{ELEC}
01/01/2018-31/01/2018	1927.776	1,879
01/02/2018-28/02/2018	1465.440	1,428
01/03/2018-31/03/2018	2587.968	2,522
01/04/2018-30/04/2018	2798.400	2,727
01/05/2018-31/05/2018	1925.856	1,877
01/06/2018-30/06/2018	2121.984	2,068
01/07/2018-31/07/2018	1674.048	1,631

01/08/2018-31/08/2018	2220.192	2,164
01/09/2018-30/09/2018	1581.888	1,542
01/10/2018-31/10/2018	2487.936	2,424
01/11/2018-30/11/2018	2407.584	2,346
01/12/2018-31/12/2018	2377.536	2,317
01/01/2019-31/01/2019	2709.024	2,640
01/02/2019-28/02/2019	2348.832	2,289
01/03/2019-31/03/2019	1722.720	1,679
01/04/2019-30/04/2019	1557.312	1,518
01/05/2019-31/05/2019	2248.032	2,191
01/06/2019-30/06/2019	1891.296	1,843
01/07/2019-31/07/2019	2316.672	2,258
01/08/2019-31/08/2019	2411.424	2,350
01/09/2019-30/09/2019	2165.472	2,110
01/10/2019-31/10/2019	1842.432	1,795
01/11/2019-30/11/2019	1801.344	1,755
01/12/2019-31/12/2019	2793.216	2,722
01/01/2020-31/01/2020	2097.216	2,044
01/02/2020-29/02/2020	1729.248	1,685
01/03/2020-31/03/2020	2230.656	2,174
01/04/2020-15/04/2020	935.136	911
Total	58376.640	56,888

Table 5-5 Emissions from electricity displaced by Gongquan CMM power plant

Year	GEN_y (MWh)	$BE_{Use,y}$ (tCO_2e)
	D	E=D* CEF_{ELEC}
01/01/2018-31/01/2018	1082.088	1,054
01/02/2018-28/02/2018	841.32	820
01/03/2018-31/03/2018	1370.844	1,336

01/04/2018-30/04/2018	1019.808	994
01/05/2018-31/05/2018	1148.544	1,119
01/06/2018-30/06/2018	948.996	925
01/07/2018-31/07/2018	765.468	746
01/08/2018-31/08/2018	985.752	961
01/09/2018-30/09/2018	1207.548	1,177
01/10/2018-31/10/2018	1037.736	1,011
01/11/2018-30/11/2018	663.012	646
01/12/2018-31/12/2018	1105.524	1,077
01/01/2019-31/01/2019	1045.116	1,018
01/02/2019-28/02/2019	988.272	963
01/03/2019-31/03/2019	871.452	849
01/04/2019-30/04/2019	1229.868	1,199
01/05/2019-31/05/2019	886.896	864
01/06/2019-30/06/2019	764.208	745
01/07/2019-31/07/2019	891.792	869
01/08/2019-31/08/2019	782.964	763
01/09/2019-30/09/2019	956.772	932
01/10/2019-31/10/2019	674.064	657
01/11/2019-30/11/2019	889.02	866
01/12/2019-31/12/2019	900.792	878
01/01/2020-31/01/2020	871.524	849
01/02/2020-29/02/2020	681.768	664
01/03/2020-31/03/2020	782.64	763
01/04/2020-15/04/2020	409.14	399
Total	25,802.928	25,145

Table 5-6 Emissions from electricity displaced by Shanmushu CMM power plant

Year	GEN_y (MWh)	$BE_{Use,y}$ (tCO$_2$e)
	D	E=D* CEF_{ELEC}
01/01/2018-31/01/2018	2425.440	2,364
01/02/2018-28/02/2018	1687.488	1,644
01/03/2018-31/03/2018	1789.920	1,744
01/04/2018-30/04/2018	2386.560	2,326
01/05/2018-31/05/2018	1682.784	1,640
01/06/2018-30/06/2018	1860.672	1,813
01/07/2018-31/07/2018	2081.184	2,028
01/08/2018-31/08/2018	2155.104	2,100
01/09/2018-30/09/2018	2196.384	2,140
01/10/2018-31/10/2018	2377.536	2,317
01/11/2018-30/11/2018	2188.512	2,133
01/12/2018-31/12/2018	1929.408	1,880
01/01/2019-31/01/2019	2473.920	2,411
01/02/2019-28/02/2019	1987.008	1,936
01/03/2019-31/03/2019	2407.008	2,346
01/04/2019-30/04/2019	1818.432	1,772
01/05/2019-31/05/2019	2669.088	2,601
01/06/2019-30/06/2019	1838.592	1,792
01/07/2019-31/07/2019	2257.152	2,200
01/08/2019-31/08/2019	2194.080	2,138
01/09/2019-30/09/2019	1867.776	1,820
01/10/2019-31/10/2019	1767.744	1,723
01/11/2019-30/11/2019	2584.992	2,519
01/12/2019-31/12/2019	811.296	791
01/01/2020-31/01/2020	343.008	334

01/02/2020-29/02/2020	2081.280	2,028
01/03/2020-31/03/2020	2044.512	1,992
01/04/2020-15/04/2020	881.760	859
Total	54,788.640	53,392

Total Baseline Emissions

Baseline emissions are given by the following equation:

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

BE_y Baseline emissions in year y (tCO_2e)

$BE_{MD,y}$ Baseline emissions from destruction of methane in the baseline scenario in year y(tCO_2e)

$BE_{MR,y}$ Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO_2e)

$BE_{Use,y}$ Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y (tCO_2e)

Table 5-7 Baseline emissions of Baijiao CMM power plant

Year	$BE_{MD,y}$ (tCO_2e)	$BE_{MR,y}$ (tCO_2e)	$BE_{Use,y}$ (tCO_2e)	BE_y (tCO_2e)
	F	C	E	G=F+C+E
01/01/2018-31/01/2018	0	10,376	1,879	12,255
01/02/2018-28/02/2018	0	7,750	1,428	9,178
01/03/2018-31/03/2018	0	13,758	2,522	16,280
01/04/2018-30/04/2018	0	16,216	2,727	18,943
01/05/2018-31/05/2018	0	10,425	1,877	12,301
01/06/2018-30/06/2018	0	12,021	2,068	14,089
01/07/2018-31/07/2018	0	8,243	1,631	9,874

01/08/2018-31/08/2018	0	11,112	2,164	13,276
01/09/2018-30/09/2018	0	8,087	1,542	9,628
01/10/2018-31/10/2018	0	14,342	2,424	16,767
01/11/2018-30/11/2018	0	13,749	2,346	16,095
01/12/2018-31/12/2018	0	12,820	2,317	15,136
01/01/2019-31/01/2019	0	13,441	2,640	16,081
01/02/2019-28/02/2019	0	12,494	2,289	14,783
01/03/2019-31/03/2019	0	8,681	1,679	10,360
01/04/2019-30/04/2019	0	7,525	1,518	9,043
01/05/2019-31/05/2019	0	12,593	2,191	14,784
01/06/2019-30/06/2019	0	10,351	1,843	12,194
01/07/2019-31/07/2019	0	11,793	2,258	14,051
01/08/2019-31/08/2019	0	13,293	2,350	15,643
01/09/2019-30/09/2019	0	10,369	2,110	12,480
01/10/2019-31/10/2019	0	9,905	1,795	11,701
01/11/2019-30/11/2019	0	9,490	1,755	11,246
01/12/2019-31/12/2019	0	13,416	2,722	16,138
01/01/2020-31/01/2020	0	10,929	2,044	12,973
01/02/2020-29/02/2020	0	9,908	1,685	11,593
01/03/2020-31/03/2020	0	12,706	2,174	14,879
01/04/2020-15/04/2020	0	5,434	911	6,345
Total	0	311,229	56,888	368,117

Table 5-8 Baseline emissions of Gongquan CMM power plant

Year	$BE_{MD,y}$ (tCO_2e)	$BE_{MR,y}$ (tCO_2e)	$BE_{Use,y}$ (tCO_2e)	BE_y (tCO_2e)
	F	C	E	G=F+C+E

01/01/2018-31/01/2018	0	7,465	1,054	8,520
01/02/2018-28/02/2018	0	6,295	820	7,115
01/03/2018-31/03/2018	0	9,724	1,336	11,060
01/04/2018-30/04/2018	0	7,777	994	8,771
01/05/2018-31/05/2018	0	8,245	1,119	9,365
01/06/2018-30/06/2018	0	6,240	925	7,165
01/07/2018-31/07/2018	0	6,611	746	7,357
01/08/2018-31/08/2018	0	7,233	961	8,193
01/09/2018-30/09/2018	0	10,923	1,177	12,100
01/10/2018-31/10/2018	0	7,439	1,011	8,450
01/11/2018-30/11/2018	0	4,896	646	5,542
01/12/2018-31/12/2018	0	7,715	1,077	8,792
01/01/2019-31/01/2019	0	8,331	1,018	9,350
01/02/2019-28/02/2019	0	7,625	963	8,588
01/03/2019-31/03/2019	0	7,030	849	7,879
01/04/2019-30/04/2019	0	8,457	1,199	9,655
01/05/2019-31/05/2019	0	6,956	864	7,820
01/06/2019-30/06/2019	0	5,688	745	6,433
01/07/2019-31/07/2019	0	6,346	869	7,215
01/08/2019-31/08/2019	0	5,862	763	6,625
01/09/2019-30/09/2019	0	7,625	932	8,557
01/10/2019-31/10/2019	0	4,577	657	5,234
01/11/2019-30/11/2019	0	6,411	866	7,278
01/12/2019-31/12/2019	0	6,890	878	7,768
01/01/2020-31/01/2020	0	6,015	849	6,864
01/02/2020-29/02/2020	0	4,523	664	5,187
01/03/2020-31/03/2020	0	5,277	763	6,040
01/04/2020-15/04/2020	0	2,811	399	3,210

Total	0	190,987	25,145	216,132

Table 5-9 Baseline emissions of Shanmushu CMM power plant

Year	$BE_{MD,y}$ (tCO_2e)	$BE_{MR,y}$ (tCO_2e)	$BE_{Use,y}$ (tCO_2e)	BE_y (tCO_2e)
	F	C	E	G=F+C+E
01/01/2018-31/01/2018	0	12,824	2,364	15,187
01/02/2018-28/02/2018	0	8,920	1,644	10,565
01/03/2018-31/03/2018	0	9,461	1,744	11,205
01/04/2018-30/04/2018	0	12,620	2,326	14,945
01/05/2018-31/05/2018	0	8,897	1,640	10,537
01/06/2018-30/06/2018	0	9,835	1,813	11,649
01/07/2018-31/07/2018	0	11,004	2,028	13,032
01/08/2018-31/08/2018	0	11,391	2,100	13,491
01/09/2018-30/09/2018	0	11,610	2,140	13,751
01/10/2018-31/10/2018	0	12,568	2,317	14,885
01/11/2018-30/11/2018	0	11,578	2,133	13,711
01/12/2018-31/12/2018	0	10,199	1,880	12,079
01/01/2019-31/01/2019	0	13,074	2,411	15,485
01/02/2019-28/02/2019	0	10,504	1,936	12,440
01/03/2019-31/03/2019	0	12,725	2,346	15,071
01/04/2019-30/04/2019	0	9,614	1,772	11,386
01/05/2019-31/05/2019	0	14,107	2,601	16,708
01/06/2019-30/06/2019	0	9,718	1,792	11,509
01/07/2019-31/07/2019	0	11,932	2,200	14,131
01/08/2019-31/08/2019	0	11,599	2,138	13,737
01/09/2019-30/09/2019	0	9,878	1,820	11,698
01/10/2019-31/10/2019	0	9,352	1,723	11,074

01/11/2019-30/11/2019	0	13,664	2,519	16,183
01/12/2019-31/12/2019	0	4,364	791	5,155
01/01/2020-31/01/2020	0	1,819	334	2,153
01/02/2020-29/02/2020	0	11,007	2,028	13,035
01/03/2020-31/03/2020	0	10,808	1,992	12,801
01/04/2020-15/04/2020	0	4,677	859	5,536
Total	0	289,749	53,392	343,140

5.2 Project Emissions

Project emissions are defined by the following equation:

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

Where:

PE_y Project emissions in year y (tCO_2e)

PE_{ME} Project emissions from energy use to capture and use methane (tCO_2e)

PE_{MD} Project emissions from methane destroyed (tCO_2e)

PE_{UM} Project emissions from un-combusted methane (tCO_2e)

5.2.1 Combustion emissions from additional energy required for CMM capture and use

$$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC}$$

Where:

$CONS_{ELEC,PJ}$ Additional electricity consumption for capture and use of methane (MWh)

CEF_{ELEC} Carbon emissions factor of electricity used by Furong coal mines (tCO_2e/MWh)

Consequently, the result of PE_{ME} is shown in the table below.

Table 5-10 Project emissions from additional energy use in Baijiao coal mine and Shanmushu coal mine[3]

Years	$CONS_{ELEC,PJ}$ (MWh)	PE_{ME} (tCO_2e)
	H	I=H * CEF_{ELEC}
01/01/2018-31/01/2018	166.2800	162
01/02/2018-28/02/2018	122.7364	120
01/03/2018-31/03/2018	187.9616	183
01/04/2018-30/04/2018	214.0736	209
01/05/2018-31/05/2018	148.3592	145
01/06/2018-30/06/2018	153.5236	150
01/07/2018-31/07/2018	134.5008	131
01/08/2018-31/08/2018	168.2060	164
01/09/2018-30/09/2018	149.8348	146
01/10/2018-31/10/2018	200.3448	195
01/11/2018-30/11/2018	169.0684	165
01/12/2018-31/12/2018	168.5452	164
01/01/2019-31/01/2019	199.9612	195
01/02/2019-28/02/2019	209.7376	204
01/03/2019-31/03/2019	166.2252	162
01/04/2019-30/04/2019	86.8304	85
01/05/2019-31/05/2019	124.1768	121
01/06/2019-30/06/2019	139.0200	135
01/07/2019-31/07/2019	191.7132	187

[3] Before the operation of the CMM power plant in Shanmushu coal mine, the CMM of Shanmushu coal mine was supplied to the CMM power plant in Bajiao coal mine, so project emissions from additional energy use in Baijiao coal mine and Shanmushu coal mine were considered as the project emission of the CMM power plant in Bajiao coal mine in the first monitoring report. After the operation of the CMM power plant in Shanmushu coal mine, part of the CMM of Shanmushu coal mine is still supplied to the CMM power plant in Bajiao coal mine, so, the project emissions from additional energy use in Baijiao coal mine and Shanmushu coal mine can not be separated.

01/08/2019-31/08/2019	162.6180	158
01/09/2019-30/09/2019	180.3628	176
01/10/2019-31/10/2019	174.1636	170
01/11/2019-30/11/2019	157.4800	153
01/12/2019-31/12/2019	168.5316	164
01/01/2020-31/01/2020	170.1780	166
01/02/2020-29/02/2020	150.7708	147
01/03/2020-31/03/2020	129.0744	126
01/04/2020-15/04/2020	127.8808	125
Total	4,522.1588	4,407

Table 5-11 Project emissions from additional energy use in Gongquan coal mine

Years	$CONS_{ELEC,PJ}$ **(MWh)**	PE_{ME} **(tCO_2e)**
	H	**I=H *** CEF_{ELEC}
01/01/2018-31/01/2018	14.1104	14
01/02/2018-28/02/2018	13.2304	13
01/03/2018-31/03/2018	16.9760	17
01/04/2018-30/04/2018	18.5176	18
01/05/2018-31/05/2018	12.8280	13
01/06/2018-30/06/2018	13.2504	13
01/07/2018-31/07/2018	12.6128	12
01/08/2018-31/08/2018	14.2328	14
01/09/2018-30/09/2018	12.5024	12
01/10/2018-31/10/2018	13.5768	13
01/11/2018-30/11/2018	7.7936	8
01/12/2018-31/12/2018	18.4408	18
01/01/2019-31/01/2019	17.4304	17

01/02/2019-28/02/2019	9.4824	9
01/03/2019-31/03/2019	9.3608	9
01/04/2019-30/04/2019	10.8152	11
01/05/2019-31/05/2019	16.0960	16
01/06/2019-30/06/2019	14.4432	14
01/07/2019-31/07/2019	14.3144	14
01/08/2019-31/08/2019	14.0056	14
01/09/2019-30/09/2019	13.3584	13
01/10/2019-31/10/2019	17.1608	17
01/11/2019-30/11/2019	18.8496	18
01/12/2019-31/12/2019	17.5032	17
01/01/2020-31/01/2020	14.1360	14
01/02/2020-29/02/2020	18.1024	18
01/03/2020-31/03/2020	9.0472	9
01/04/2020-15/04/2020	11.0912	11
Total	393.2688	383

5.2.2 Combustion emissions from use of captured methane

$$PE_{MD} = MD_{ELEC} \times (CEF_{CH4} + r \times CEF_{NMHC})$$

$$r = Pc_{NMHC} / Pc_{CH4}$$

Where:

MD_{ELEC} Methane destroyed through power generation (tCH_4)

CEF_{CH4} Carbon emission factor for combusted methane (2.75 tCO_2/tCH_4)

CEF_{NMHC} Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) ($tCO_2/tNMHC$)

r Relative proportion of NMHC compared to methane

Pc_{CH4} Concentration (in mass) of methane in extracted gas (%)

Pc_{NMHC} NMHC concentration (in mass) in extracted gas (%)

The yearly tests shows that the concentration of NMHC in extracted CMM from Furong coal mines only accounts no more than 0.016% or 0.014% in volume, which is much lower than 1%. Therefore, the combustion emission from NMHC is ignored in ex ante emission calculations.

$$PE_{MD} = MD_{ELEC} \times CEF_{CH4}$$

$$MD_{ELEC} = MM_{ELEC} \times Eff_{ELEC}$$

The IPCC default value of Eff_{ELEC}, 99.5%, is applied to the proposed project. With CEF_{CH4} value of 2.75 tCO2/tCH4, PE_{MD} is calculated and shown in the table below.

Table 5-12 Combustion emissions from use of captured methane from Baijiao coal mines

Years	MM_{ELEC} (tCH_4)	MD_{ELEC} (tCH_4)	PE_{MD} (tCO_2e)
	B	J=B* Eff_{ELEC}	K =J* CEF_{CH4}
01/01/2018-31/01/2018	370.59	368.73	1,014
01/02/2018-28/02/2018	276.77	275.39	757
01/03/2018-31/03/2018	491.37	488.92	1,345
01/04/2018-30/04/2018	579.13	576.23	1,585
01/05/2018-31/05/2018	372.30	370.44	1,019
01/06/2018-30/06/2018	429.31	427.17	1,175
01/07/2018-31/07/2018	294.39	292.92	806
01/08/2018-31/08/2018	396.86	394.88	1,086
01/09/2018-30/09/2018	288.81	287.37	790
01/10/2018-31/10/2018	512.23	509.67	1,402
01/11/2018-30/11/2018	491.02	488.57	1,344
01/12/2018-31/12/2018	457.84	455.55	1,253

01/01/2019-31/01/2019	480.04	477.64	1,314
01/02/2019-28/02/2019	446.21	443.98	1,221
01/03/2019-31/03/2019	310.05	308.50	848
01/04/2019-30/04/2019	268.76	267.42	735
01/05/2019-31/05/2019	449.76	447.51	1,231
01/06/2019-30/06/2019	369.69	367.84	1,012
01/07/2019-31/07/2019	421.18	419.07	1,152
01/08/2019-31/08/2019	474.76	472.39	1,299
01/09/2019-30/09/2019	370.34	368.48	1,013
01/10/2019-31/10/2019	353.77	352.00	968
01/11/2019-30/11/2019	338.94	337.24	927
01/12/2019-31/12/2019	479.16	476.76	1,311
01/01/2020-31/01/2020	390.34	388.39	1,068
01/02/2020-29/02/2020	353.85	352.09	968
01/03/2020-31/03/2020	453.77	451.50	1,242
01/04/2020-15/04/2020	194.06	193.09	531
Total	11,115.3	11,059.73	30,414

Table 5-13 Combustion emissions from use of captured methane from Gongquan coal mine

Years	MM_{ELEC} (tCH_4)	MD_{ELEC} (tCH_4)	PE_{MD} (tCO_2e)
	B	J=B* Eff_{ELEC}	K =J* CEF_{CH4}
01/01/2018-31/01/2018	266.62	265.28	730
01/02/2018-28/02/2018	224.81	223.69	615
01/03/2018-31/03/2018	347.28	345.54	950
01/04/2018-30/04/2018	277.76	276.37	760
01/05/2018-31/05/2018	294.48	293.01	806

01/06/2018-30/06/2018	222.85	221.74	610
01/07/2018-31/07/2018	236.12	234.94	646
01/08/2018-31/08/2018	258.31	257.02	707
01/09/2018-30/09/2018	390.12	388.16	1,067
01/10/2018-31/10/2018	265.68	264.35	727
01/11/2018-30/11/2018	174.84	173.97	478
01/12/2018-31/12/2018	275.52	274.15	754
01/01/2019-31/01/2019	297.54	296.05	814
01/02/2019-28/02/2019	272.32	270.96	745
01/03/2019-31/03/2019	251.05	249.80	687
01/04/2019-30/04/2019	302.02	300.51	826
01/05/2019-31/05/2019	248.43	247.19	680
01/06/2019-30/06/2019	203.16	202.14	556
01/07/2019-31/07/2019	226.65	225.52	620
01/08/2019-31/08/2019	209.34	208.29	573
01/09/2019-30/09/2019	272.32	270.95	745
01/10/2019-31/10/2019	163.48	162.66	447
01/11/2019-30/11/2019	228.97	227.83	627
01/12/2019-31/12/2019	246.06	244.83	673
01/01/2020-31/01/2020	214.82	213.75	588
01/02/2020-29/02/2020	161.54	160.73	442
01/03/2020-31/03/2020	188.47	187.52	516
01/04/2020-15/04/2020	100.41	99.90	275
Total	6,820.96	6,786.86	18,664

Table 5-14 Combustion emissions from use of captured methane from Shanmushu coal mine

Years	MM_{ELEC} (tCH_4)	MD_{ELEC} (tCH_4)	PE_{MD} (tCO_2e)

	B	J=B* Eff_{ELEC}	K =J* CEF_{CH4}
01/01/2018-31/01/2018	457.99	455.70	1,253
01/02/2018-28/02/2018	318.58	316.98	872
01/03/2018-31/03/2018	337.88	336.19	925
01/04/2018-30/04/2018	450.70	448.45	1,233
01/05/2018-31/05/2018	317.75	316.16	869
01/06/2018-30/06/2018	351.26	349.50	961
01/07/2018-31/07/2018	393.00	391.03	1,075
01/08/2018-31/08/2018	406.83	404.80	1,113
01/09/2018-30/09/2018	414.66	412.58	1,135
01/10/2018-31/10/2018	448.87	446.62	1,228
01/11/2018-30/11/2018	413.50	411.43	1,131
01/12/2018-31/12/2018	364.23	362.41	997
01/01/2019-31/01/2019	466.94	464.60	1,278
01/02/2019-28/02/2019	375.15	373.27	1,026
01/03/2019-31/03/2019	454.47	452.20	1,244
01/04/2019-30/04/2019	343.37	341.65	940
01/05/2019-31/05/2019	503.81	501.29	1,379
01/06/2019-30/06/2019	347.06	345.33	950
01/07/2019-31/07/2019	426.14	424.01	1,166
01/08/2019-31/08/2019	414.24	412.17	1,133
01/09/2019-30/09/2019	352.79	351.02	965
01/10/2019-31/10/2019	333.98	332.31	914
01/11/2019-30/11/2019	488.00	485.56	1,335
01/12/2019-31/12/2019	155.86	155.08	426
01/01/2020-31/01/2020	64.96	64.63	178
01/02/2020-29/02/2020	393.10	391.14	1,076
01/03/2020-31/03/2020	386.02	384.09	1,056

01/04/2020-15/04/2020	167.03	166.19	457
Total	10,348.17	10,296.43	28,315

5.2.3 Un-combusted methane from end uses

Not all of the methane used to generate electricity will be combusted, and a small amount will escape into the atmosphere.

$$PE_{UM} = GWP_{CH4} \times MM_{ELEC} \times (1\text{-}Eff_{ELEC})$$

Table 5-15 Un-combusted methane from end uses in Baijiao coal mines

Year	MM_{ELEC} (tCH_4)	Total CH_4 emissions (tCH_4)	PE_{UM} (tCO_2e)
	B	**L=B*(1-** Eff_{ELEC} **)**	**M=L*** GWP_{CH4}
01/01/2018-31/01/2018	370.59	1.85	52
01/02/2018-28/02/2018	276.77	1.38	39
01/03/2018-31/03/2018	491.37	2.46	69
01/04/2018-30/04/2018	579.13	2.90	81
01/05/2018-31/05/2018	372.30	1.86	52
01/06/2018-30/06/2018	429.31	2.15	60
01/07/2018-31/07/2018	294.39	1.47	41
01/08/2018-31/08/2018	396.86	1.98	56
01/09/2018-30/09/2018	288.81	1.44	40
01/10/2018-31/10/2018	512.23	2.56	72
01/11/2018-30/11/2018	491.02	2.46	69
01/12/2018-31/12/2018	457.84	2.29	64
01/01/2019-31/01/2019	480.04	2.40	67
01/02/2019-28/02/2019	446.21	2.23	62
01/03/2019-31/03/2019	310.05	1.55	43
01/04/2019-30/04/2019	268.76	1.34	38

01/05/2019-31/05/2019	449.76	2.25	63
01/06/2019-30/06/2019	369.69	1.85	52
01/07/2019-31/07/2019	421.18	2.11	59
01/08/2019-31/08/2019	474.76	2.37	66
01/09/2019-30/09/2019	370.34	1.85	52
01/10/2019-31/10/2019	353.77	1.77	50
01/11/2019-30/11/2019	338.94	1.69	47
01/12/2019-31/12/2019	479.16	2.40	67
01/01/2020-31/01/2020	390.34	1.95	55
01/02/2020-29/02/2020	353.85	1.77	50
01/03/2020-31/03/2020	453.77	2.27	64
01/04/2020-15/04/2020	194.06	0.97	27
Total	11,115.3	55.58	1,556

Table 5-16 Un-combusted methane from end uses in Gongquan coal mine

Year	MM_{ELEC} (tCH_4)	Total CH_4 emissions (tCH_4)	PE_{UM} (tCO_2e)
	B	**L=B*(1-** Eff_{ELEC} **)**	**M=L*** GWP_{CH4}
01/01/2018-31/01/2018	266.62	1.33	37
01/02/2018-28/02/2018	224.81	1.12	31
01/03/2018-31/03/2018	347.28	1.74	49
01/04/2018-30/04/2018	277.76	1.39	39
01/05/2018-31/05/2018	294.48	1.47	41
01/06/2018-30/06/2018	222.85	1.11	31
01/07/2018-31/07/2018	236.12	1.18	33
01/08/2018-31/08/2018	258.31	1.29	36
01/09/2018-30/09/2018	390.12	1.95	55
01/10/2018-31/10/2018	265.68	1.33	37

01/11/2018-30/11/2018	174.84	0.87	24
01/12/2018-31/12/2018	275.52	1.38	39
01/01/2019-31/01/2019	297.54	1.49	42
01/02/2019-28/02/2019	272.32	1.36	38
01/03/2019-31/03/2019	251.05	1.26	35
01/04/2019-30/04/2019	302.02	1.51	42
01/05/2019-31/05/2019	248.43	1.24	35
01/06/2019-30/06/2019	203.16	1.02	28
01/07/2019-31/07/2019	226.65	1.13	32
01/08/2019-31/08/2019	209.34	1.05	29
01/09/2019-30/09/2019	272.32	1.36	38
01/10/2019-31/10/2019	163.48	0.82	23
01/11/2019-30/11/2019	228.97	1.14	32
01/12/2019-31/12/2019	246.06	1.23	34
01/01/2020-31/01/2020	214.82	1.07	30
01/02/2020-29/02/2020	161.54	0.81	23
01/03/2020-31/03/2020	188.47	0.94	26
01/04/2020-15/04/2020	100.41	0.50	14
Total	6,820.96	34.10	955

Table 5-17 Un-combusted methane from end uses in Shanmushu coal mine

Year	MM_{ELEC} (tCH_4)	Total CH_4 emissions (tCH_4)	PE_{UM} (tCO_2e)
	B	**L=B*(1-** Eff_{ELEC} **)**	**M=L*** GWP_{CH4}
01/01/2018-31/01/2018	457.99	2.29	64
01/02/2018-28/02/2018	318.58	1.59	45
01/03/2018-31/03/2018	337.88	1.69	47
01/04/2018-30/04/2018	450.70	2.25	63

01/05/2018-31/05/2018	317.75	1.59	44
01/06/2018-30/06/2018	351.26	1.76	49
01/07/2018-31/07/2018	393.00	1.96	55
01/08/2018-31/08/2018	406.83	2.03	57
01/09/2018-30/09/2018	414.66	2.07	58
01/10/2018-31/10/2018	448.87	2.24	63
01/11/2018-30/11/2018	413.50	2.07	58
01/12/2018-31/12/2018	364.23	1.82	51
01/01/2019-31/01/2019	466.94	2.33	65
01/02/2019-28/02/2019	375.15	1.88	53
01/03/2019-31/03/2019	454.47	2.27	64
01/04/2019-30/04/2019	343.37	1.72	48
01/05/2019-31/05/2019	503.81	2.52	71
01/06/2019-30/06/2019	347.06	1.74	49
01/07/2019-31/07/2019	426.14	2.13	60
01/08/2019-31/08/2019	414.24	2.07	58
01/09/2019-30/09/2019	352.79	1.76	49
01/10/2019-31/10/2019	333.98	1.67	47
01/11/2019-30/11/2019	488.00	2.44	68
01/12/2019-31/12/2019	155.86	0.78	22
01/01/2020-31/01/2020	64.96	0.32	9
01/02/2020-29/02/2020	393.10	1.97	55
01/03/2020-31/03/2020	386.02	1.93	54
01/04/2020-15/04/2020	167.03	0.84	23
Total	10,348.17	51.74	1,449

5.2.4 Total Project Emissions

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

Table 5-18 Project emissions of Baijiao coal mine

Year	PE_{ME} (tCO_2e)	PE_{MD} (tCO_2e)	PE_{UM} (tCO_2e)	PE_y (tCO_2e)
	I	K	M	N=I+K+M
01/01/2018-31/01/2018	162	1,014	52	1,228
01/02/2018-28/02/2018	120	757	39	916
01/03/2018-31/03/2018	183	1,345	69	1,596
01/04/2018-30/04/2018	209	1,585	81	1,874
01/05/2018-31/05/2018	145	1,019	52	1,215
01/06/2018-30/06/2018	150	1,175	60	1,384
01/07/2018-31/07/2018	131	806	41	978
01/08/2018-31/08/2018	164	1,086	56	1,305
01/09/2018-30/09/2018	146	790	40	977
01/10/2018-31/10/2018	195	1,402	72	1,669
01/11/2018-30/11/2018	165	1,344	69	1,577
01/12/2018-31/12/2018	164	1,253	64	1,481
01/01/2019-31/01/2019	195	1,314	67	1,576
01/02/2019-28/02/2019	204	1,221	62	1,488
01/03/2019-31/03/2019	162	848	43	1,054
01/04/2019-30/04/2019	85	735	38	858
01/05/2019-31/05/2019	121	1,231	63	1,415
01/06/2019-30/06/2019	135	1,012	52	1,199
01/07/2019-31/07/2019	187	1,152	59	1,398
01/08/2019-31/08/2019	158	1,299	66	1,524
01/09/2019-30/09/2019	176	1,013	52	1,241
01/10/2019-31/10/2019	170	968	50	1,187
01/11/2019-30/11/2019	153	927	47	1,128
01/12/2019-31/12/2019	164	1,311	67	1,542

01/01/2020-31/01/2020	166	1,068	55	1,289
01/02/2020-29/02/2020	147	968	50	1,165
01/03/2020-31/03/2020	126	1,242	64	1,431
01/04/2020-15/04/2020	125	531	27	683
Total	4407	**30,414**	**1556**	**36,377**

Table 5-19 Project emissions of Gongquan coal mine

Year	PE_{ME} **(tCO_2e)**	PE_{MD} **(tCO_2e)**	PE_{UM} **(tCO_2e)**	PE_y **(tCO_2e)**
	I	**K**	**M**	**N=I+K+M**
01/01/2018-31/01/2018	14	730	37	781
01/02/2018-28/02/2018	13	615	31	660
01/03/2018-31/03/2018	17	950	49	1,015
01/04/2018-30/04/2018	18	760	39	817
01/05/2018-31/05/2018	13	806	41	859
01/06/2018-30/06/2018	13	610	31	654
01/07/2018-31/07/2018	12	646	33	691
01/08/2018-31/08/2018	14	707	36	757
01/09/2018-30/09/2018	12	1,067	55	1,134
01/10/2018-31/10/2018	13	727	37	777
01/11/2018-30/11/2018	8	478	24	510
01/12/2018-31/12/2018	18	754	39	810
01/01/2019-31/01/2019	17	814	42	873
01/02/2019-28/02/2019	9	745	38	792
01/03/2019-31/03/2019	9	687	35	731
01/04/2019-30/04/2019	11	826	42	879
01/05/2019-31/05/2019	16	680	35	730
01/06/2019-30/06/2019	14	556	28	598
01/07/2019-31/07/2019	14	620	32	666

01/08/2019-31/08/2019	14	573	29	616
01/09/2019-30/09/2019	13	745	38	796
01/10/2019-31/10/2019	17	447	23	487
01/11/2019-30/11/2019	18	627	32	677
01/12/2019-31/12/2019	17	673	34	725
01/01/2020-31/01/2020	14	588	30	632
01/02/2020-29/02/2020	18	442	23	482
01/03/2020-31/03/2020	9	516	26	551
01/04/2020-15/04/2020	11	275	14	300
Total	383	18,664	955	20,002

Table 5-20 Project emissions of Shanmushu coal mine

Year	PE_{ME} (tCO₂e)	PE_{MD} (tCO₂e)	PE_{UM} (tCO₂e)	PE_y (tCO₂e)
	I	K	M	N=I+K+M
01/01/2018-31/01/2018	0	1,253	64	1,317
01/02/2018-28/02/2018	0	872	45	916
01/03/2018-31/03/2018	0	925	47	972
01/04/2018-30/04/2018	0	1,233	63	1,296
01/05/2018-31/05/2018	0	869	44	914
01/06/2018-30/06/2018	0	961	49	1,010
01/07/2018-31/07/2018	0	1,075	55	1,130
01/08/2018-31/08/2018	0	1,113	57	1,170
01/09/2018-30/09/2018	0	1,135	58	1,193
01/10/2018-31/10/2018	0	1,228	63	1,291
01/11/2018-30/11/2018	0	1,131	58	1,189
01/12/2018-31/12/2018	0	997	51	1,048
01/01/2019-31/01/2019	0	1,278	65	1,343

01/02/2019-28/02/2019	0	1,026	53	1,079
01/03/2019-31/03/2019	0	1,244	64	1,307
01/04/2019-30/04/2019	0	940	48	988
01/05/2019-31/05/2019	0	1,379	71	1,449
01/06/2019-30/06/2019	0	950	49	998
01/07/2019-31/07/2019	0	1,166	60	1,226
01/08/2019-31/08/2019	0	1,133	58	1,191
01/09/2019-30/09/2019	0	965	49	1,015
01/10/2019-31/10/2019	0	914	47	961
01/11/2019-30/11/2019	0	1,335	68	1,404
01/12/2019-31/12/2019	0	426	22	448
01/01/2020-31/01/2020	0	178	9	187
01/02/2020-29/02/2020	0	1,076	55	1,131
01/03/2020-31/03/2020	0	1,056	54	1,110
01/04/2020-15/04/2020	0	457	23	480
Total	0	28,315	1449	29,764

5.3 Leakage

The formula for leakage is given as follows:

$$LE_y = LE_{d,y} + LE_{o,y}$$

Where:

LE_y Leakage emissions in year y (tCO_2e)

$LE_{d,y}$ Leakage emissions due to displacement of other baseline thermal energy uses of methane in year y (tCO_2e)

$LE_{o,y}$ Leakage emissions due to other uncertainties in year y (tCO_2e)

According to the approved revised PDD, the leakage is 0.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2018	421,288	39,115	0	382,173
Year 2019	405,483	37,589	0	367,894
Year 2020	100,617	9,440	0	91,177
Total	927,388	86,144	0	841,244

The value of, GWP_{CH4} was increase from 21 to 28 as per AR5 of IPCC . In order to fairly compare the estimated annual emission reductions and actual emission reductions, 28 of GWP_{CH4} was introduced in the ER calculation of the registered ER calculation.

Year	Net GHG emission reductions or removals in the registered ER calculation (tCO_2e) with 28 of GWP_{CH4} *	Net GHG emission reductions or removals (tCO_2e)
Year 2018	313,868*	382,173
Year 2019	313,868	367,894
Year 2020	90,901	91,177
Total	718,637	841,244

* the data is from the registered ER calculation sheet with 28 of GWP $_{CH4}$

By comparison, the actual emission reduction is 17.06% higher than the estimated emission reductions. For the project, the increase of emission reductions 17.06% means the increase of CMM consumption and electricity generation.

The actual CMM consumption, 28,284.43t, is 15.24% higher than the estimated CMM consumption, 24544.69945t(= 10,720*2+10720*(31+29+31+15)/366). But the price of the CMM was considered as zero, so, the CMM increase have no impact on additionality.

The actual eletricity generation of the project in the monitoring period is 138968.2080 MWh. The estimated eletricity generation of the project in the monitoring period is 109901.6393MWh(=48,000*2+48000*(31+29+31+15)/366).The actual eletricity generation of the project is 26.45% higher than the estimated value.

But based on the registered PDD, 300% increase of electricity generation of the project should make the project IRR equal to the benchmark and make the project no additonality. So 26.45% increase of electricity supply is much lower than 300% and the additonality of the project have no impact.

APPENDIX X: <EVIDENCE FOR SD CONTRIBUTIONS >

1. The employee list for the project

序号	岗位名称	人数	姓名	职责	其他
	负责经理	2	张红革、刘小章	总体负责	代表集团负责瓦斯电厂的管理
1	工程师（电控）	3	王飞云、陈贵平、刘曰军	负责完成电厂电控专业管理及技术方面的制度、规程、系统图、措施等的编制与监督执行工作。	1.了解高压电气相关国家标准和规定，熟悉供配电一、二次系统，较好掌握供配电电气系统安装、调试及运维工作； 2.掌握电气设备结构、原理； 3.掌握电气保护原理； 4.熟悉发电机组主要设备及主要辅机的构造、性能及工作原理。
2	工程师（机修）	2	孙力军、张亮	负责全面实施电厂设备维修保养计划、对设备突发故障的应急维修及抢修。	1.熟悉各种泵、阀、风机、发电机等机械维护，熟知设备保养、维修流程及规范和标准；能够对工程机械设备进行维修维护及故障排除并能从事现场工作； 2.掌握瓦斯电厂相关设备各种自动控制、热工保护和测量仪表的作用、工作原理及实验方法； 3.掌握瓦斯电厂相关设备的保护自动装置； 4.熟悉瓦斯电厂主要设备及主要辅机的构造、性能及工作原理； 5.熟悉DCS控制系统原理。
3	值长	6	王越建 刘润生 孙成红 王利 韩刚龙 郝埃连	负责当班期间动力安全、经济运行、生产操作、故障处理。	1.熟悉“两票三制”相关规定，熟悉电厂各专业运行规程及调度规程； 2.具备电厂事故处理经验，能准确判断处理设备常见故障。
4	主值	6	王翔 孙丽萍 丁芹 王银 陈桂平 朱斯	主要负责集控室DCS中控的监盘、操作、定期切换试验、事故处理等工作。	熟悉掌握DCS中控设备及PLC操作规程。
5	检修班长	6	杨福林 贾小龙 石双厚 马树 林飞 石今春	负责设备的日常维护和检修，确保设备运行正常，对设备故障及时组织处理。	了解电厂机、炉、电、水处理专业技术知识，能准确判断并处理常见故障。
6	检修员	6	郭旦 贾桂林 石栓成 马占云 申彩玲 李天荣	了解厂区内全部设备的运行状态，有效地处理各种临时性、突发性设备故障等。	了解电厂机、炉、电、水处理专业技术知识，能准确判断并处理常见故障。
7	调度员	5	刘埃生 石利军 杨万富 马祥 刘龙	负责及时准确的将生产现场情况向各车间传达生产任务、生产调度指令、各项通知通报等。	了解电厂运行规程，能及时准确的将现场情况上传下达。
8	瓦斯抽采员	4	吴七七 王路 程斯语 乔军	负责高、低负压瓦斯抽放泵站及系统的管理工作。	有瓦斯抽采证件者优先。
9	供热员	3	蔡农中 高强 尤帅齐	负责电厂供热区域内供暖及保暖工作。	熟悉电厂供热管网、锅炉、换热设备的运行管理。
10	总人数	43人			

2, the employee list for Baijiao CMM power plant

白皎员工

值长	2	王越建 刘润生
主值	2	王翔 孙丽萍
检修班长	2	杨福林 贾小龙
检修员	2	郭旦 贾桂林
调度员	2	刘埃生 石利军
瓦斯抽采员	2	吴七七 王路
供热员	1	蔡农中
总人数	13	

3，the employee list for Gongquan CMM power plant

珙泉员工

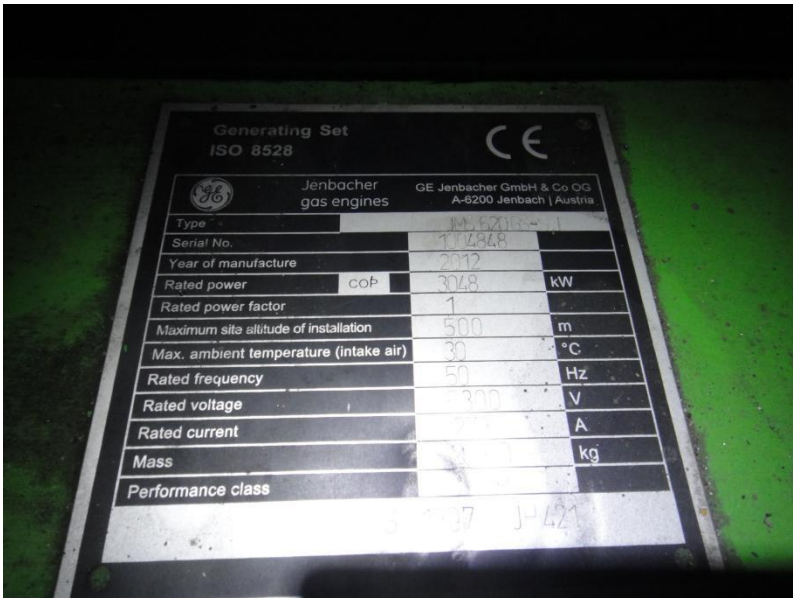
值长	2	孙成红 王利
主值	2	丁芹 王银
检修班长	2	石双厚 马树
检修员	2	石栓成 马占云
调度员	1	杨万富
瓦斯抽采员	1	程斯语
供热员	1	高强
总人数	11	

4.the employee list for Shanmushu CMM power plant

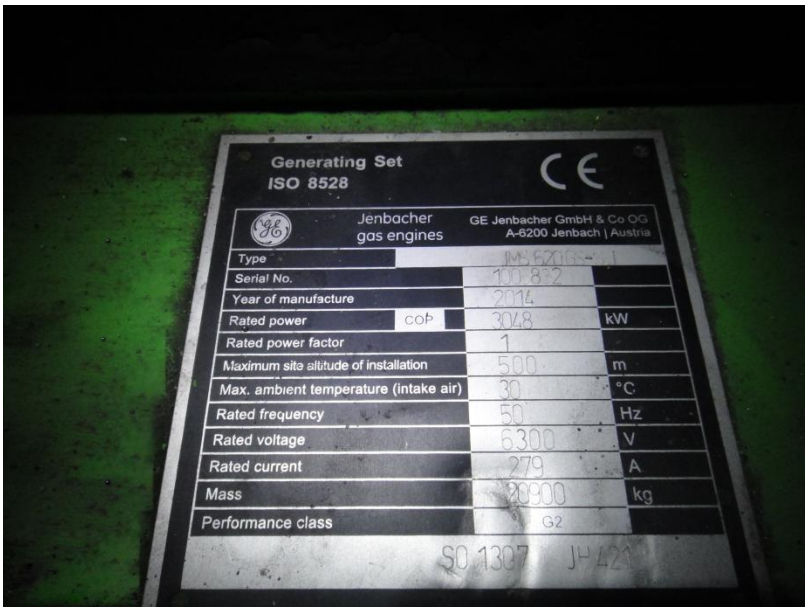
杉木树员工

值长	2	韩刚龙 郝埃连
主值	2	陈桂平 朱斯
检修班长	2	林飞 石今春
检修员	2	申彩玲 李天荣
调度员	2	马祥 刘龙
瓦斯抽采员	1	乔军
供热员	1	尤帅齐
总人数	12人	

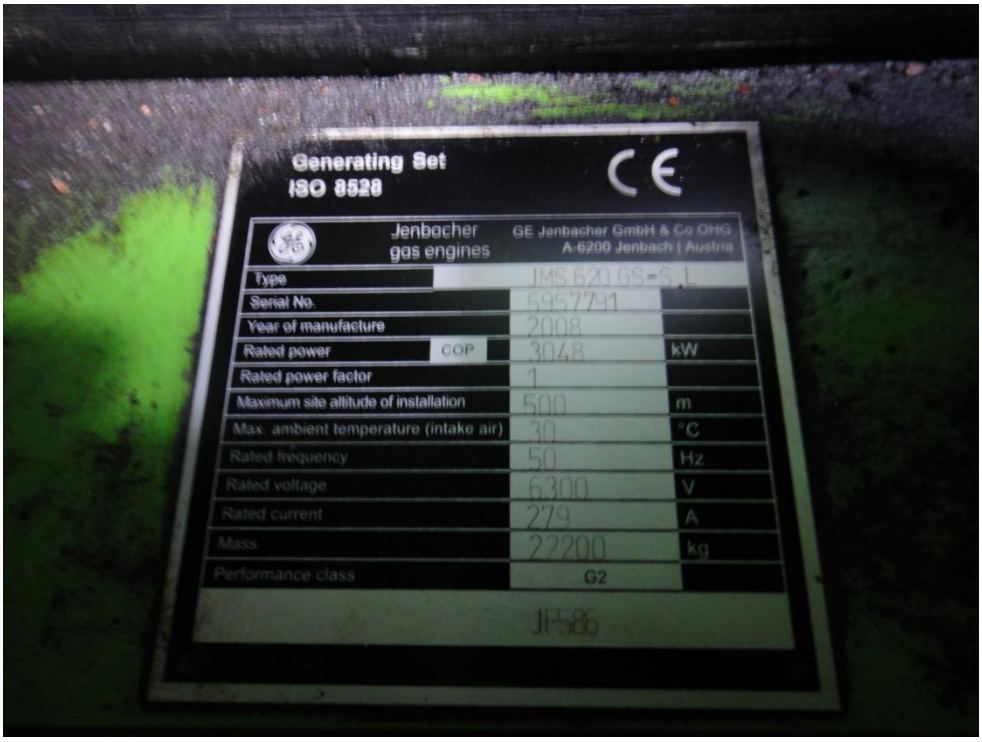
5. The generator nameplate of the GE JMS620GS-S.L 3MW level gas generators



The nameplate of 1# Generators for Shanmushu CMM power plant



The nameplate of 2# Generators for Shanmushu CMM power plant



The nameplate of 1# Generators for Baijiao CMM power plant

The nameplate of 2# Generators for Baijiao CMM power plant