



GUIZHOU PANJIANG LOW CONCENTRATION COAL MINE METHANE POWER GENERATION PROJECT PHASE 2



Document Prepared By Shenzhen CTI International Certification Co., Ltd

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Summary:

- ***A brief description of the verification and the project***

The project activity developed in Pan County, Liupanshui City, Guizhou Province, P. R. China, is a Coal Mine Methane Power Generation Project, utilizes the coal mine methane (CMM) with methane concentration of 6-30% extracted from coal mines to generate electricity for captive use. The Project covers three coalmines with five mining areas with total methane resource of 52.51 billion m³ and extractable methane of 31.83 billion m³. The Project can reduce GHG emissions by avoiding release of methane into the atmosphere and replacing the equivalent amount of electricity that would have been purchased from the CSPG and the captive power plants. The project started operation on 01-April-2011 and it was registered as a CDM project activity in UNFCCC with the Registration Ref. No. 6948 on 05-December-2012. After conduct the gap validation under VCS program, it was allocated with VCS ID 2291.

- ***The purpose and scope of verification***

The objective of the verification is to have an independent review ex-post determination by a VVB (Validation and Verification Body) of the monitored GHG emission reductions that have occurred as a result of the implementation of the project activity during a defined monitoring period.

- ***The monitoring period***

This is the 2nd monitoring period started from 26-December-2019 to 31-March-2021 for VCS scheme.

- ***The method and criteria used for verification***

Verification is conducted using Shenzhen CTI International Certification Co., Ltd procedures in line with the requirements specified in the latest version of the VCS Validation and Verification Manual and applying auditing techniques. The verification team assessed the project activity's compliance against the VCS Version 4.1, the selected CDM methodology and the project monitoring report. The project is eligible under Project Sectoral Scope 1. Energy (renewable/non-renewable) and Sectoral Scope 08: Mining/mineral production. The verification criteria followed the guidance documents provided by VCS included the following:

VCS Version 4.1, VCS Program Guide Version 4.0 and the applied CDM methodology "ACM0008. Consolidated 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 through flaring or flameless oxidation" (Version 07).

- ***The number of findings raised during verification***

In the course of the verification, 4 Corrective Action Requests (CARs), 3 Clarification Requests (CLs) were raised and successfully closed. The assessment is included in the report.

- ***Any uncertainties associated with the verification***

There are no restrictions of uncertainty with the verification.

- ***Summary of the verification conclusion***

Climate Bridge (Shanghai) Ltd. has commissioned the Shenzhen CTI International Certification Co., Ltd to carry out the Verified Carbon Standard (VCS) 2nd periodical verification of the project, "Guizhou Panjiang Low Concentration Coal Mine Methane Power Generation Project Phase 2" (No. 2291) with regards to the relevant requirements of VCS standard Version 4.1. CTI confirms all verification activities including objectives, scope and criteria, level of assurance, monitoring and monitoring report adhere to VCS Version 4.1 and all associated updated as documented in this report, are complete.

CTI concludes that the project activity "Guizhou Panjiang Low Concentration Coal Mine Methane Power Generation Project Phase 2" in China, as described in the final version of the Monitoring Report, meets all relevant requirements for VCS verification activity and correctly applied the methodology ACM0008.

Version 07. Hence CTI is able to certify that the GHG emission reduction from the project during the monitoring period from 26-December-2019 to 31-March-2021 amount to 484,655 tCO₂e.

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1. INTRODUCTION

1.1 Objective

Climate Bridge (Shanghai) Ltd. has commissioned the Shenzhen CTI International Certification Co., Ltd to carry out the Verified Carbon Standard (VCS) 2nd periodical verification of the project for the monitoring period from 26-December-2019 to 31-March-2021. The objective of verification is to have an independent review ex-post determination by a VVB of the monitored GHG emission reductions that have occurred as a result of the project activity implemented during a defined monitoring period. The evaluation is done against the requirements of the VCS Version 4.1 based on the monitoring report. In order to confirm that the GHG emission reductions sound reasonable and meet the identified criteria, the verification involves the assessment of monitoring plan conformance to VCS rules and applied methodology. Verification is requirement and is seen as necessary to provide assurance on the generation of VCUs.

1.2 Scope and Criteria

The scope of the verification is to verify that: (a) the actual monitoring system and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; (b) the GHG emission reductions data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reductions data are free from material misstatement; (c) the reported GHG emissions data is sufficiently supported by evidence. Verification shall ensure that the reported GHG emission reductions are complete and accurate in accordance with the applicable VCS criteria in order to be certified. Verification is conducted using CTI procedures in line with the requirements specified in the VCS Program and ISO14064-3 requirements and applying auditing techniques. Verification team assessed and determines that the implementation and operation of the project activity, and steps to report GHG emission reductions comply with the VCS rules. The verification involved a document review of relevant documentation and interview with the project participants. Verification is not meant to provide any consultancy towards the project participants; however, stated request for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

1.3 Level of Assurance

All GHG sinks, sources and GHG emissions equal to or greater than 1% of the total GHG assertions are considered. The project as generated average of 382,898 VCUs per year, and therefore can be considered as a normal project per the VCS rules, in regards to its GHG emission reduction values, subject to a 1% materiality threshold.

The assessment was conducted to provide a reasonable level of assurance of compliance against the defined audit criteria and materiality threshold within the audit scope. Based on the audit findings the verification statement reasonably assures that the GHG assertion is materially correct and is a fair representation of the GHG data and information.

1.4 Summary Description of the Project

The project is implemented by Guizhou Panjiang CBM Development & Utilization Co., Ltd., the main purpose of this project activity is to utilize the coal mine methane (CMM) with methane concentration of 6-30% extracted from coal mines located in Pan County, Liupanshui City, Guizhou Province to generate electricity for captive use. The Project covers three coalmines with five mining areas with total methane resource of 52.51 billion m³ and extractable methane of 31.83 billion m³. Thirty CMM power generation units with total capacity of 17.7 MW are involved and 25.22 million m³ of methane is utilized by the project annually. No coal bed methane (CBM) or ventilation air methane (VAM) utilization is involved in the project as per validation report/5/ and it is located inside the Dashan Town, Xiangshui Town, Hongguo Town, Panjiang Town, Pan County, Liupanshui City.

The project can reduce GHG emissions by avoiding release of methane into the atmosphere and replacing the equivalent amount of electricity that would have been purchased from the China Southern Power Grid (CSPG) and the captive power plants. Waste heat from the generators have been recovered to provide heat to the coal mines. Emission reductions due to heat replacement are not claimed, it is confirmed as conservative. In the monitoring period from 26-December-2019 to 31-March-2021, total 16,787.74 tCH₄ from CMM was captured and utilized and the net electricity supplied to the coal mines for captive use is 88,306.176 MWh. The total verified carbon units (VCUs) achieved in the monitoring period are 484,655 tCO₂e, which has been verified by on-site inspection, and checking the related documentations, interview with the project implementer.

The project activity generates GHG emission reductions by utilizing the low concentration coal mine methane (CMM), that otherwise would be vented into the atmosphere directly and generate electricity to supply to the coal mines displace part of the electricity generated by the grid which is dominated by fossil fuel-fired power plants thus the project generates GHG emission reductions and produces financial, social and environmental benefits. The project has resulted in the local sustainable development as described in Section 1 of the Monitoring Report. The project was registered as a CDM project on 05-December-2012 with CDM Reference No. of 6948/48/ and further registered by gap validation as a VCS project activity with the Ref. No. 2291 on 01-December-2020/45/ and the emission reductions have been certified as verified carbon units (VCUs) for this monitoring period.

2. VERIFICATION PROCESS

2.1 Method and Criteria

A project specific Verification and monitoring plan was developed to guide the verification auditing process to ensure efficiency and effectiveness. The purpose of the verification is to present a risk assessment for determining the nature and extent of validation procedures necessary to ensure the risk of auditing error is reduced to a reasonable level. According to the ISO14064-3, the criteria are the policy, procedure or requirement used as reference against which evidence is compared. Therefore, verification of the monitoring plan and the reported project results were measured for compliance against the following criteria:

- VCS Standard, v4.1/39/
- VCS Program Guide, v4.0/38/
- VCS Program Definitions, v4.1/37/
- CDM methodology ACM0008 "Consolidated 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 through flaring or flameless oxidation" (Version 07)/32/

The verification process derived from all items in the verification criteria stated above. Field sampling and techniques based on the project parameters, scope and best professional judgement of the verification team in order to meet a reasonable level of assurance. The verification method of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- A desk review of the VCS Monitoring Report/1/ submitted by the client and additional supporting documents with the use of customized verification documents checklist
- Verification planning
- On-Site assessment
- Background investigation and follow-up interviews with personnel of the project developer and related farmers, technicians
- Draft verification reporting
- Resolution of Corrective Action Requests (CARs) and Clarification Requests (CLs)
- Final verification reporting
- Technical review
- Final approval of the verification.

The verification process derived from all items in the verification criteria stated above. Field sampling and techniques based on the project parameters, scope and best professional judgement of the verification team in order to meet a reasonable level of assurance.

2.2 Document Review

The VCS MR/1/ and supporting background documents related to the project implementation were reviewed. Document review was conducted to ensure consistency with and identify any deviation from VCS program requirements. Desk review included an examination of the project details, data and parameters, and quantification of GHG emission reductions.

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports referring to the monitoring or to the basic conditions and technical data.

The references used in the course of this verification are summarized in Appendix 3.

The verification was performed basing on the documents check and site inspection/measurements, refer to the section 4 of this report for the verification process detail and corresponding documents review.

2.3 Interviews

The objective of the interview process was to solicit important information from personnel related to project and relevant to the verification process. Onsite interviews and information discussions were conducted with representatives from project implementer, operation staffs, local officers, residents and Project VCS development consultant. The interviews were performed by the verification team on-site (within the project area, in Pan County, Liupanshui City, Guizhou Province, P. R. China) and the following is a list of the main interviewees and subject.

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Liu	Yong	Guizhou Panjiang CBM Development & Utilization Co., Ltd. /Manager	16-August-2021	- General aspects of the project - Changes since validation / previous verifications - Calibration procedures - Power generation situation - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks	Dezheng Tong

					- Procedural aspects of the verification - Maintenance - Environmental aspects - Project ownership	
2.	Ren	Qiuli	Guizhou Panjiang CBM Development & Utilization Co., Ltd. / Yueliangtian Nansan CMM Power Plant Chief	16-August-2021	- Calibration procedures - Power generation situation - Involved personnel and responsibilities - Training and practice of the operational personnel	Dezheng Tong
3.	Ren	Zhengrui	Guizhou Panjiang CBM Development & Utilization Co., Ltd. / Jinjia Jinyi CMM Power Plant Chief	16-August-2021	- Implementation of the monitoring plan - Maintenance - Environmental aspects - Job creation - Working environment	
4.	Wu	Mingliang	Guizhou Panjiang CBM Development & Utilization Co., Ltd. / Jinjia Jin'er CMM Power Plant Chief	16-August-2021		
5.	Huang	Lei	Guizhou Panjiang CBM Development & Utilization Co., Ltd. / Xiangshui Hexi CMM Power Plant Chief	17-August-2021		
6.	Zhang	Hua	Panjiang City Environment Protection Bureau/ Environmental Monitoring Team leader	17-August-2021	- Local stakeholder communication - Stakeholder comments - Environmental aspects - Environmental protection Measurements	Dezheng Tong
7.	He	Xiaoyun	Local residents	17-August-2021	- Local stakeholder communication	
8.	Pan	Xiao'e	Local residents	17-August-2021	- Stakeholder comments	
9.	Wu	Siran	Climate Bridge (Shanghai) Ltd./Project Manager	16-August-2021~17-August-2021	- Financial aspects - Deviations - Monitoring period - Project activity starting date - Assumptions	Dezheng Tong

					- Monitoring plan and implementation - Monitoring measurements - Editorial issues of the VCS MR	
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2.4 Site Inspections

The verification site inspection was conducted on 16-August-2021~17-August-2021. A ground inspection of the project was conducted during the site visit and the verification team interviewed representatives from project implementer, operation staffs, local officers, residents and Project VCS development consultant

During the site inspection, the project location, main equipment, monitoring equipment and project implementation were inspected and document evidence were checked, details as following table,

Duration of on-site inspection: 16-August-2021~17-August-2021				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening meeting Interview with representatives from PP	Office in Guizhou Panjiang CBM Development & Utilization Co., Ltd. in Pan County, Liupanshui City, Guizhou Province, P.R. China	16-August-2021	Dezheng Tong
2	On-site inspection of project	CMM stations in Dashan Town, Xiangshui Town, Hongguo Town, Panjiang Town, Panjiang County, Liupanshui City, Guizhou Province, P.R. China	16-August-2021~17-August-2021	Dezheng Tong
3	Documents check	Office in Guizhou Panjiang CBM Development & Utilization Co., Ltd. in Pan County, Liupanshui City, Guizhou Province, P.R. China	17-August-2021	Dezheng Tong
4	Finding Summary	Office in Guizhou Panjiang CBM Development & Utilization Co., Ltd. in Pan County, Liupanshui City, Guizhou Province, P.R. China	17-August-2021	Dezheng Tong
5	Close Meeting	Office in Guizhou Panjiang CBM Development & Utilization Co., Ltd. in Pan County, Liupanshui City, Guizhou Province, P.R. China	17-August-2021	Dezheng Tong

2.5 Resolution of Findings

Material discrepancies identified in the course of the validation are addressed either as CARs, CLs or FARs.

A Corrective Action Request (CAR) is established where:

The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

The VCS Version 4.1 requirements have not been met;

There is a risk that the emission reductions cannot be monitored or calculated.

A Clarification Request (CL) will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A Forward Action Request (FAR) will be issued when certain issues related to project implementation should be reviewed during the first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in Appendix 4 of this report.

In the course of the verification, 4 Corrective Action Requests (CARs), 3 Clarification Requests (CLs) were raised and successfully closed. The assessment is included in Appendix 4 of the report.

2.5.1 Forward Action Requests

This is the 2nd periodical verification, and there is no FAR raised in the 1st periodical verification report/6/ and validation report/5/.

2.6 Eligibility for Validation Activities

The VVB Shenzhen CTI International Certification Co., Ltd holds accreditation for both validation and verification for the relevant sectoral scope 1 and 8.

3. VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project started operation on 01-April-2011 and it was registered as a CDM project activity in UNFCCC with the Registration Ref. No. 6948 on 05-December-2012. The crediting period under CDM started on 05-December-2012 and will be expired on 04-December-2022.

And after gap validation joint with 1st periodic verification under VCS Program, it was registered as a VCS project and allocated with VCS ID 2291 on 01-December-2020/45/.

The project is located in China and is developed and operated by Guizhou Panjiang CBM Development & Utilization Co., Ltd. which is a Chinese Investment Enterprise/7/.

The project has sought the registration with the VCS Program and validation was conducted by VVB and has been successfully registered in VCS Program and via checking the CDM and VCS dedicated website of the project.

The GHG emission reductions of 346,403 tCO₂ generated from 01-April-2011 to 04-December-2012 by the project has been issued as CCER used for Chinese allowance trading, the period is verified as before the CDM registration time, which can be verified by checking the project dedicated China CCER website/40/.

Besides, CTI confirmed that GHG emission reductions of 627,061 tCO₂e generated from 26-February-2018 to 25-December-2019 by the project has been issued as VCU under VCS program/45/ and GHG emission reductions of 1,532,606 tCO₂ in monitoring period from 05-December-2012 to 25-February-2018 has been issued as CERs under CDM program, which can be verified by checking the project dedicated UNFCCC website /48/.

The verification team also checked the Gold Standard Registry/42/ and the Climate Action Reserve to determine if the project is producing other environmental credits. It was confirmed that the project is not listed on these registries and therefore there is no other environmental credit (for example renewable energy certificate) which has or will be produced by or obtained for the project. And via checking all the related dedicate website for GHG schemes, it is verified there is no overlapping of the monitoring period among the different GHG schemes and thus no double counting occurred. All credits from 26-December-2019 to 31-March-2021 will be claimed only under VCS program as VCUs for the project to avoid double counting.

Via on-site interview with the project implementer and checking the project dedicated UNFCCC website <https://cdm.unfccc.int/Projects/DB/RINA1344437738.67/view>, it is verified that the implementation of the project is consistent with the description in the Monitoring Report (MR) and the Project Design Document (PDD) and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 26-December-2019 to 31-March-2021.

3.2 Methodology Deviations

There is no methodology deviation applied to this monitoring period.

3.3 Project Description Deviations

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

3.4 Grouped Project

This section is not applicable as the project is not a grouped project.

4. VERIFICATION FINDINGS

4.1 Project Implementation Status

Through the onsite visit, interviewing the project developer and reviewing the project operation, CTI confirmed that the project was implemented to utilize the coal mine methane (CMM) with methane concentration of 6-30% extracted from coal mines located in Pan County, Liupanshui City, Guizhou Province to generate electricity for captive use. The Project covers three coal mines with five mining areas with total methane resource of 52.51 billion m³ and extractable methane of 31.83 billion m³. No coal bed methane (CBM) or ventilation air methane (VAM) utilization is involved in the project/5/.

In accordance with the latest approved CDM PDD/3/, there are total 30 sets of CMM power generators with the total installed capacity of 17.7MW will be installed to utilize CMM for power generation. Via on-site investigation/31/ and checking the previous verification report/6/, it is confirmed that 24 sets of CMM power generators with total installed capacity of 14.2MW have been installed before the start of this monitoring period. Power Plant Xiangshui Botu has not started construction yet due to low methane concentration in the CMM gas stream extracted from the coal mine, this is verified by checking the CH₄ concentration statement of Xiangshui Botu mining areas/16/. Xiangshui Botu power plant will be constructed in the future if the methane concentration reaches 6% and keep stable after continuous monitoring.

Via checking the MR/1/ and by site inspection, CTI verified that there are no changes on the key equipment and technology since the last periodical verification of the project.

On the basis of site visit and the reviewed project monitoring report and other supporting docs, it can be confirmed that the realized technology, as well as the monitoring and metering equipment, the project has been implemented and operated as applied methodology/32/ and monitoring plan described in the registered PDD/3/ except deviations assessed in the section 3.3 of this report.

This verification covers the period from 26-December-2019 to 31-March-2021 (including both days¹). The total 16,787.74 tCH₄ from CMM was captured and utilized and the net electricity supplied to the coal mines for captive use is 88,306.176 MWh. The total verified carbon units (VCUs) achieved in the monitoring period are 484,655 tCO₂e/2/.

The commenced electricity generation date of each power plant is as below table, which has been confirmed in the daily operational log/17/, Report of acceptance of completed project/10/ against the previous verification report/6/.

Table 4-1 Construction and commissioning date of each plant

Coal mine/mining Area		Construction date	Commission Date
Jinjia	Jinyi	30-September-2010	01-April-2011
	Jin'er	05-October-2010	01-April-2011

¹ Via checking the 1st VCS verification report and MR, it is confirmed that this monitoring period starts from 08:00 of 25-December-2019 as last monitoring period (1st VCS) ended at 08:00 of 25-December-2019. The emission reductions achieved from 08:00 to 24:00 of 25-December-2019 are claimed in this monitoring period.

Yueliangtian	Nansan	15-October-2010	13-April-2011
Xiangshui	Hexi	29-September-2010	25-June-2011

As part of the site visit the Verification Team was able to confirm that the project implementation is in accordance with the project description contained in the registered PDD/3/. There are no any material discrepancies between project implementation and the project description except power plant Xiangshui Botu has not started construction yet due to low methane concentration in the CMM gas stream extracted from the coal mine.

The project started operation on 01-April-2011 and it was registered as a CDM project activity in UNFCCC with the Registration Ref. No. 6948 on 05-December-2012. And after gap validation joint with 1st periodic verification under VCS Program, it was registered as a VCS project and allocated with VCS ID 2291 on 01-December-2020/45/.

The net GHG emission reductions during this monitoring period from the project was not used for compliance with emission trading programs or to meet binding limits on GHG emissions. Via on-site interview with the project implementer and checking the project dedicated UNFCCC website <https://cdm.unfccc.int/Projects/DB/RINA1344437738.67/view>, it is verified that the implementation of the project is consistent with the description in the Project Design Document (PDD) and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 26-December-2019 to 31-March-2021.

Besides, based on VVB's local expertise, China has a national emissions trading scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO_{2e}/year which has been verified in the public website/46/, and it is confirmed that the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner by checking the enforced company list in public information/47/. Hence, it is confirmed that the emission reductions will not be double counted.

The project was registered as a VCS project activity with the VCS Ref. No. 2291/45/, with 10 years fixed crediting period started from 01-April-2011 to 31-March-2021 under VCS Program.

This monitoring period (26-December-2019 to 31-March-2021) is the 2nd monitoring period in the 10-years fixed crediting period.

Details of the project location are given in table 4-2 below:

Table 4-2: Project Location

No.	Project Location
Host Country	China
Region:	Guizhou Province
Project location address:	Dashan Town, Xiangshui Town, Hongguo Town, Panjiang Town, Pan County, Liupanshui City

The geographic coordinates of the involved power stations are assessed in the below table of this report.

Table 4-3: Geographic coordinates of the involved power stations

Coal mine	Power station	Decimal Longitude	Decimal Latitude
Jinjia	Jinyi	104.5295E	25.6857N
	Jin'er	104.5428E	25.7003N

Yueliangtian	Nansan	104.5123E	25.9099N
Xiangshui	Botu	104.5993E	25.4693N
	Hexi	104.5835E	25.4634N

The location of the project site is verified with on-site investigation by GPS devices and confirmed by checking the map/41/.

Details of the project equipment technical parameters are given in table 4-4 below:

Table 4-4 Project equipment technical parameters

Parameter	Unit	Value			
CMM generators					
Type:	-	600GJZ1-1PWWD	600GF1-1RW	500GF1-3RW	500GF-WS-2
Rated Power	kW	600	600	500	500
Continuous power	kW	480	480	400	400
Unit amount	-	9	18	2	1
Rated Current	A	1,083	1,083	901	902
Rated voltage	V	400	400	400	400
Rated speed	r/min	1,000	1,000	1,000	1,000
Frequency	Hz	50	50	50	50
Lifetime	year	10	10	10	10
Manufacturer	-	Shangdong Oil Field Shengli Power Machinery Group Co., Ltd. (Shengdong)			Guizhou Zhenfeng Power Generation Co., Ltd.

Via site inspection of the nameplate of the equipment/31/ and checking the Technical Particulars of equipment/18/, CTI verified that the technical parameters listed in above table are correct and actual and consistent with PDD.

The approved consolidated methodology applied in the project activity is ACM0008 “Consolidated 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 through flaring or flameless oxidation” (Version 07)/32/. Also refers to the latest approved version of the following tools and guidelines:

- “Tool to calculate the emission factor for an electricity system” (version 02.2.1)/33/;

Via on-site inspection and interview with the project implementer, CTI verified that the project contributes the sustainable development goal through the following aspects:

- SDG 8.3 Create job opportunities by implementation of the project – *verified by checking the employment contracts/26/ and monthly payroll to the plant staffs/27/;*
- SDG 11.6 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted) – *verified by checking the Emission Reduction Calculation sheet/2/;*
- SDG 13 Climate Action – *verified by checking the Emission Reduction Calculation sheet/2/.*

Via checking the validation report/5/ and previous verification report/6/, CTI verified that there were no any previously validated methodology deviations.

In conclusion, Verification Team was able to confirm that the project implementation is in accordance with the project description contained in the registered PDD/3/ except power plant Xiangshui Botu has not started construction yet due to low methane concentration in the CMM gas stream extracted from the coal mine.

CL 01 and CL 02 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

4.2 Safeguards

4.2.1 No Net Harm

In China, an Environmental Impacts Assessment is required according to Chinese legislation. The EIA was designed by Guizhou Environmental Science Research and Design Institute/8/ and approved by Guizhou Province Environmental Protection Bureau on 9-February-2011/9/. The analysis of the environmental impacts of the project activity is sufficiently described according to EIA. The assessment is as below,

It is considered that the environmental impacts and the relevant mitigation methods have been comprehensively described in Section 2.1 of MR including the air pollution and wastewater, noise, solid waste and impact on the ecosystem according to the EIA report.

The environmental impacts of the project were sufficiently assessed by means of an Environmental Impact Assessment (EIA) study report according to the Chinese laws & regulations such as “Environmental Protection Law of P.R. China” and “Law of the People's Republic of China on the Environmental Impact Assessment”. The environmental impact assessment was completed in October 2010 by Environmental Science Research & Design Institute of Gansu Province. The EIA report /8/, which was approved by the Guizhou Province Environmental Protection Bureau (EPB) on 09-February-2011, was inspected by the VVB to be valid/9/. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project development.

During the site inspection, the project was implemented normally. The verifier revealed that noise during operation is generated by the low-concentration CMM generators, circulating cooling tower and pumps and the Noise emission from the project operation is confirmed as complies with the standard requirements of Category 2 (GB12348-2008).

Associated with the review of EIA, there was no adverse effect on the ecology, air, water and solid waste, for the project subject to the implementation of pollution mitigation measures according to the EIA report. There was also no any endangered species found in the project location.

As per the approval of EIA, it stated that the inspectors from the EPB have to carry out monitoring work for the environmental impact arisen from the project activity during CMM power plant commissioning periodically. Via interview with the local officer from EPB, it is confirmed that they are satisfactory with the environmental protection and recovery work carried out by the project owner. The EPB also did not receive any public comment on the project activity during this monitoring period.

During the on-site interview, the local residents were interviewed if there was critical impact to their living environment. It is verified that the project activity does not cause adverse effect to their daily life.

Furthermore, via interview with local officer and stakeholders, it is confirmed that the implementation of the project will improve local socio-economic development through creating career opportunities and paying taxes to local government.

In conclusion, there were some impacts on environment during the construction and operation periods, which has been demonstrated in the PDD/3/, MR/1/ and EIA/8/, also the proper measurements have been carried out by project implementer to mitigate such impacts.

4.2.2 Local Stakeholder Consultation

A stakeholder survey was carried out by the project developer during November 2010 which was prior to the publication of the PDD on the UNFCCC website.

A stakeholder meeting was held on 15-November-2010 in the conference room of Panjiang Coal Mine, presided over by the representative of the Project owner. Representatives of relevant personnel of Panjiang Coal Mine, local villagers and local government were invited to attend the meeting, totally 70 copies of questionnaires were issued to relevant personnel of Panjiang Coal Mine, local villagers and government officials with all pieces of reply received. The stakeholders' background information and comments from questionnaires were summarized and recorded in the PDD/3/, Section E and has been assessed during the validation process/5/.

During the implementation stage of this monitoring period, via checking the local communication survey records/25/ and interview with the local officer and local residents during site visit, it is confirmed that the local authority has conducted follow-up interviews and ongoing communication with local stakeholders to collect any comments or inputs to the project implementation. Based on the verification team's expertise, it is confirmed that the local government agencies and competent authorities will conduct spot checks on the implementation of the project from time to time as per the request from the local government's regulations.

Moreover, the project owner carried out a questionnaire survey for the local stakeholder to collect the relevant comments and suggestions in May 2020 during this monitoring period. Via checking the filled 40 questionnaires/25/, interview with the local officer and local resident during site visit, it is verified that Seventy five percent of the respondents believe that the Project will not have any environmental impact, but there are a few respondents who show their concern about the potential noise pollution and water pollution caused by the Project. Project Owner explained about this in the stakeholder meeting and brought up with corresponding approaches to minimize the impact of the Project on the environment and related mitigative actions have been carried out by Project Owner as below:

1. The noise during operation is generated by the low-concentration CMM generators, circulating cooling tower and pumps, via site inspection, VVB confirmed that the plant buildings that contain machinery are all built from reinforced concrete, with soundproof materials installed inside, atop and at the openings. And the Noise emission from the project operation is confirmed as complies with the standard requirements of Category 2 (GB12348-2008) which is in line with the requirement of EIA/8/.
2. There are wastewater generated during the operation including condensate water, cooling water and domestic wastewater and via site inspection, VVB confirmed that no pollutions in condensate water and cooling water, an all the domestic wastewater has been properly handled and used as fertilizer.

All the mitigation actions have been verified by interview with local officer, the local officer from Panjiang City Environment Protection Bureau Environmental Monitoring Team has confirmed that the project was under supervised and the implementation of the project is in line with the local environment protection regulations and EIA/8/. And via checking the filled 40 questionnaires/25/, it is confirmed that no one

thinks that the Project will have a negative impact on the local life. Hence there is no need to change the project design based on the stakeholder inputs and CTI confirmed that all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals which in compliance with the VCS requirements.

CAR 01 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

4.3 AFOLU-Specific Safeguards

N.A.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

4.4.1 Assessment of Data and parameters Available at Validation

By means of comparison of the MR/1/ and the ER calculation/2/ with the registered PDD/3/, the verification team has checked whether all parameters fixed ex-ante have been applied correctly.

The parameters that are fixed ex ante are following:

Parameters	Source of data	Values applied	Demonstration by Verification team
$CMM_{BL,i,y}$ - Pre-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y	Data was provided by the project owner, which has been verified and determined in the registered PDD, validation report.	0	This is an ex-ante fixed value during the crediting period, the value is verified as consistent among the registered PDD/3/ and the validation report/5/.
$PMM_{BL,i,y}$ - Post-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y .	Data was provided by the project owner, which has been verified and determined in the registered PDD, validation report.	0	This is an ex-ante fixed value during the crediting period, the value is verified as consistent among the registered PDD/3/ and the validation report/5/.
Eff_{ELEC} - Efficiency of methane destruction in power plant	Data from registered PDD, validation report, applied methodology and IPCC	99.5%	This is an ex-ante fixed value during the crediting period, the value is verified as consistent among the registered PDD/3/, the validation report/5/, applied methodology and IPCC/43/.
CEF_{CH_4} - Carbon emission factor for combusted methane	Data from registered PDD, validation report and applied methodology, it is a default value	2.75 tCO ₂ e/tCH ₄	This is an ex-ante fixed value during the crediting period, the value is consistent among the registered /3/, the validation report/5/ and applied methodology/32/.
D_{CH_4} - Density of methane under normal conditions of	Data from registered PDD, validation report and 2006 IPCC Guidelines for National	0.67kg/m ³	This is an ex-ante fixed value during the crediting period, the value is consistent among the CDM registered/3/, the validation

temperature and pressure	Greenhouse Gas Inventories		report/5/ and 2006 IPCC Guidelines for National Greenhouse Gas Inventories /43/.
GWP_{CH_4} - Global warming potential of methane	Data from IPCC Fifth Assessment Report: Climate Change 2007 (AR5)	28 tCO ₂ e/tCH ₄	According to VCS standard 4.1/39/, Global warming potential can use IPCC Fifth Assessment Report: Climate Change 2007 (AR5)/34/
EF_{ELEC} -	Data from registered PDD, validation report	0.7134 tCO ₂ /MWh	This is an ex-ante fixed value during the crediting period, the value is calculated as per "Tool to calculate the emission factor for an electricity system"/33/ and verified as consistent among the registered PDD/3/, the validation report/5/.

In conclusion, the parameter fixed ex ante has been indicated in the registered PDD/3/. And the MR is checked as in line with the PDD/3/.

4.4.2 Assessment of Data and parameters Monitored

During the verification all relevant monitoring parameters as listed in PDD/3/ have been verified and summarized in the below table.

MM_{ELEC}	Methane sent to the power generators											
Title in line with Methodology?	Yes											
Data unit correctly expressed?	Yes – t CH ₄											
Appropriate description?	Yes											
Monitored Value?		<table><tr><th>Year</th><th>MM_{ELEC}</th></tr><tr><td>26-December-2019~31-December-2019</td><td>276.89</td></tr><tr><td>01-January-2020~31-December-2020</td><td>13,224.44</td></tr><tr><td>01-January-2021~31-March-2021</td><td>3,286.40</td></tr><tr><td>Total</td><td>16,787.74</td></tr></table>	Year	MM_{ELEC}	26-December-2019~31-December-2019	276.89	01-January-2020~31-December-2020	13,224.44	01-January-2021~31-March-2021	3,286.40	Total	16,787.74
Year	MM_{ELEC}											
26-December-2019~31-December-2019	276.89											
01-January-2020~31-December-2020	13,224.44											
01-January-2021~31-March-2021	3,286.40											
Total	16,787.74											
Correct value provided?	Yes											
Source clearly referenced? (appropriate?)	Yes– it is measured continuously by the Flow meters (with temperature and pressure transmitter) and gas analysers. Flow meters (with temperature and pressure transmitter) and gas analysers are installed at each CMM power plant. MM_{ELEC} is continuously measured and hourly recorded by DCS system automatically. The MM_{ELEC} is calculated based on the value of gas flow rate, pressure, temperature measured by flow meters and CH₄ concentration of CMM measured by gas analysers. The calculation is done by the DCS system automatically. The Flow meters (with temperature and pressure transmitter) and gas analysers monitors the Methane sent to the power generators. And the calculation is done by the DCS system automatically. The meter readings and calculation result are recorded by the operation staff of each CMM power plant daily and aggregated monthly. Meanwhile, the automatic monitoring DCS system of each CMM power plant collects the data from the meters every day and delivers them to the project owner/13/. The PP gather all the values from 4 CMM power plants and get the total value of MM_{ELEC}											

Choice of data correctly justified?	Yes –monitored by Flow meters (with temperature and pressure transmitter) and gas analysers installed in each station.
Measurement method and procedures correctly described?	Yes –measured continuously by Flow meters (with temperature and pressure transmitter) and gas analysers of each CMM power plant, the operators read the value from the meters at 8:00 per day. Based on the difference between the two meters' values for each meter on 8:00 (next day) and 8:00 for that day the value of MM_{elec} is determined. Accordingly, the operator issues the daily reports. The daily reports record the quantities of gross methane sent to the power generators per day and based on the daily reports for a month, the PP issues a corresponding monthly report/13/.
Calculation method?	Yes –sum of monthly data/13/
Monitoring frequency correctly described?	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions - verified as per PDD and the applied methodology
Monitoring equipment correctly described?	Refer to Appendix 5 for the details of each monitoring device. The model, serial No., accuracy class and calibration information of the equipment used has been provided, the devices were calibrated by Chongqing Testing Centre of Science & Technology and National Station of Mining Safety Metrology/24/ annually in line with the frequency defined in PDD as annually, by checking the calibration report/23/, it is confirmed that the calibrations for the equipment were valid for this monitoring period.
QA/QC procedure correctly described?	Yes- QA/QC procedure for meter calibration maintenance and recording; procedure for monitoring staff training and competence were established and implemented. The data flow and protection process was observed during the on-site verification. In case the main meters are out of order, no emission reductions will be claimed. The calibration is conducted according to the relevant standard “Verification regulation of different pressure type flow meter (JJG640-2016)"/28/. The monitored data will be kept for two years after the last issuance.
Purpose of data?	Calculation of baseline emission from methane released into atmosphere; project emission from use of captured methane and from un-combusted methane from project activity.
Comments?	N/A

CON _{ELEC,PJ}	Additional electricity consumption for capture and use or destruction of methane, which is imported electricity from the coal mine electricity network												
Title in line with Methodology?	Yes												
Data unit correctly expressed?	Yes – MWh												
Appropriate description?	Yes												
Monitored Value?		<table><tr><th>Year</th><th>CON_{ELEC,PJ}</th></tr><tr><td>26-December-2019~31-December-2019</td><td>3.168</td></tr><tr><td>01-January-2020~31-December-2020</td><td>122.064</td></tr><tr><td>01-January-2021~31-March-2021</td><td>25.176</td></tr><tr><td>Total</td><td>150.408</td></tr></table>	Year	CON _{ELEC,PJ}	26-December-2019~31-December-2019	3.168	01-January-2020~31-December-2020	122.064	01-January-2021~31-March-2021	25.176	Total	150.408	
Year	CON _{ELEC,PJ}												
26-December-2019~31-December-2019	3.168												
01-January-2020~31-December-2020	122.064												
01-January-2021~31-March-2021	25.176												
Total	150.408												
Correct value provided?	Yes												

Source clearly referenced? (appropriate?)	Yes—it is monitored by electric meters installed at each CMM power plant with accuracy of 0.5s and recorded monthly at 8:00h on 25 th of each month
Choice of data correctly justified?	Yes –monitored by electric meters installed at each CMM power plant
Measurement method and procedures correctly described?	Yes –it is monitored by electric meters installed at each CMM power plant with accuracy of 0.5s and recorded monthly at 8:00h on 25 th of each month as per the power purchase agreement/21/. The meter monitors the additional electricity consumption for capture and use or destruction of methane. The meter readings are recorded by the operators monthly/11/. Meanwhile, the automatic monitoring system will collect the data from the meters every month and deliver them to the PP. The meter readings are recorded by the PP, based on that, related notes/12/ have been issued. The PP gather all the values from 4 CMM power plants and get the total value of CONSELEC,PJ .
Calculation method?	Yes –sum of monthly data/11/
Monitoring frequency correctly described?	Continuously measured by meter and monthly recorded/11/ - verified as per PDD/3/ and the applied methodology/32/ At 8:00h on 25 th of each month, the monitoring team record the bidirectional electricity meter's readings and complete Meter Reading Records/11/. The staff from power grid company issue the electricity transaction notes/12/ according to the meter readings monthly.
Monitoring equipment correctly described?	Refer to Appendix 5 for the details of each monitoring device. The model, serial No., accuracy class and calibration information of the equipment used has been provided, the electricity meters were calibrated by Testing centre of Guizhou Panjiang CBM Development & Utilization Co., Ltd. and Liuzhi Working Condition (Group) Measurement and Testing Institute/24/ annually, which are confirmed in line with the frequency defined in PD as once in one year, by checking the calibration report/23/, it is confirmed that the calibration for this equipment was valid for this monitoring period.
QA/QC procedure correctly described?	Yes- the electricity transaction notes/12/ have been used for cross-check and via comparing the electricity transaction notes/12/ for this motoring period with the electricity meter reading records/11/, CTI verified that the values are consistent. The calibration frequency of electricity meters with accuracy of 0.5s is verified in compliance with national standard Technical Administrative Code of Electric Energy Metering (DL/T 448-2016)/30/.
Purpose of data?	Project emissions from combustion emission from additional energy required for CMM capture and use.
Comments?	N/A

GEN_y		Electricity generation by the project activity in year y	
Title in line with Methodology?	Yes		
Data unit correctly expressed?	Yes – MWh		
Appropriate description?	Yes		
Monitored Value?		Year	GEN _y
		26-December-2019~31-December-2019	1,363.632

	01-January-2020~31-December-2020	69,025.968
	01-January-2021~31-March-2021	17,916.576
	Total	88,306.176
Correct value provided?	Yes	
Source clearly referenced? (appropriate?)	Yes—it is monitored by electric meters installed at each CMM power plant with accuracy of 0.5s and recorded monthly at 8:00h on 25 th of each month	
Choice of data correctly justified?	Yes –monitored by electric meters installed at each CMM power plant	
Measurement method and procedures correctly described?	Yes –it is monitored by electric meters installed at each CMM power plant with accuracy of 0.5s and recorded monthly at 8:00h on 25th of each month as per the power purchase agreement/21/. The meters monitor the electricity generation by the project activity. The meter readings are recorded by the operators monthly/11/. Meanwhile, the automatic monitoring system will collect the data from the meters every month and deliver them to the PP. The meter readings are recorded by the PP, based on that, related transaction notes/12/ have been issued. The PP gather all the values from 4 CMM power plants and get the total value GEN_y.	
Calculation method?	Yes –sum of monthly data/11/	
Monitoring frequency correctly described?	Continuously measured by meter and monthly recorded/11/ - verified as per PDD/3/ and the applied methodology/32/ At 8:00h on 25th of each month, the monitoring team record the bidirectional electricity meter's readings and complete Meter Reading Records/11/. The staff from power grid company issue the electricity transaction notes/12/ according to the meter readings monthly.	
Monitoring equipment correctly described?	Refer to Appendix 5 for the details of each monitoring device. The model, serial No., accuracy class and calibration information of the equipment used has been provided, the electricity meters were calibrated by Testing centre of Guizhou Panjiang CBM Development & Utilization Co., Ltd. and Liuzhi Working Condition (Group) Measurement and Testing Institute/24/ annually, which are confirmed in line with the frequency defined in PD as once in one year, by checking the calibration report/23/, it is confirmed that the calibration for this equipment was valid for this monitoring period.	
QA/QC procedure correctly described?	Yes- the electricity transaction notes/12/ have been used for cross-check and via comparing the electricity transaction notes/12/ for this motoring period with the electricity meter reading records/11/, CTI verified that the values are consistent. The calibration frequency of electricity meters with accuracy of 0.5s is verified in compliance with national standard Technical Administrative Code of Electric Energy Metering (DL/T 448-2016)/30/.	
Purpose of data?	Calculation of baseline emission from power generation replaced by the project.	
Comments?	N/A	

CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various)
Title in line with Methodology?	Yes

Data unit correctly expressed?	Yes –tCO ₂ /tNMHC
Appropriate description?	Yes
Monitored Value?	Not applicable since PC _{NMHC} <1%
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	During this monitoring period, there is no need to monitor this value due to PC _{NMHC} is lower than 1%. See below table for assessment of PC _{NMHC} .
Choice of data correctly justified?	Yes –measurement is documented as per latest approved PDD/3/ and applied methodology/32/
Measurement method and procedures correctly described?	Yes –measurement is documented as per latest approved PDD/3/ and applied methodology/32/
Calculation method?	Yes –there is no need to monitor this value due to PC _{NMHC} is lower than 1%
Monitoring frequency correctly described?	Data monitored annually - as per latest approved PDD/3/ and applied methodology/32/
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	Calculation of project emission from methane released into atmosphere.
Comments?	N/A

PC_{CH4}	Concentration (in mass) of methane in extracted gas (%), measured on wet basis
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –%
Appropriate description?	Yes
Monitored Value?	Refer to ER sheet/2/ for details of monthly values
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes– it is measured continuously by the gas analysers installed at each CMM power plant
Choice of data correctly justified?	Yes –measured continuously by the gas analysers installed at each CMM power plant
Measurement method and procedures correctly described?	Yes –monitored continuously by the gas analysers installed at each CMM power plant PC _{CH4} is continuously measured and hourly recorded by DCS system automatically.
Calculation method?	Yes –PC _{CH4} is calculated based on the CH ₄ concentration of CMM measured by gas analyzers and recorded hourly as CH ₄ concentration of CMM measured by gas analyzers/14/. The monthly value is calculated by the hourly recorded data, the value of daily data is the weighted average value. The gas analysers monitors the concentration (in mass) of methane in extracted gas (%). The gas analysers readings are recorded by the operation staff of each CMM power plant hourly/14/ and calculated monthly. Meanwhile, the automatic monitoring DCS system of each CMM power plant collects the data from the gas analysers every hour and delivers them to the project owner. The PP gather all the values/14/ from 4 CMM power plants.

Monitoring frequency correctly described?	Data monitored continuously and recording hourly, to calculate weighted average value - verified as per PDD and the applied methodology
Monitoring equipment correctly described?	Refer to Appendix 5 for the details of each monitoring device. The model, serial No., accuracy class and calibration information of the equipment used has been provided, the devices were calibrated by National Station of Mining Safety Metrology/24/ annually in line with the frequency defined in PDD as annually, by checking the calibration report/23/, it is confirmed that the calibrations for the equipment were valid for this monitoring period.
QA/QC procedure correctly described?	It is confirmed that the calibrations for the equipment were calibrated in compliance with the monitoring requirements in PDD. In case the main gas analysers is out of order, no emission reductions will be claimed.
Purpose of data?	Calculation of baseline emission from methane released into atmosphere.
Comments?	N/A

PC _{NMHC}	NMHC concentration (in mass) in extracted gas		
Title in line with Methodology?	Yes		
Data unit correctly expressed?	Yes – %		
Appropriate description?	Yes		
Monitored Value?	Power plant	PC _{NMHC} In Apr.2020	PC _{NMHC} In Jan.2021
	Jinyi	0.020%	0.010%
	Yueliangtian Nansan	0.650%	0.950%
	Xianghusi Hexi	N.D (not detected)	0.060%
	Jin'er	0.030%	0.010%
Correct value provided?	Yes		
Source clearly referenced? (appropriate?)	Yes– it is monitored by the laboratory of Coal Mine Exploration of Guizhou Province sampled at the inlet of gas analyser and values derived from the annual NMHC concentration analysis report dated 26-April-2020 and 06-January-2021/15/.		
Choice of data correctly justified?	Yes – Via checking the annual NMHC concentration analysis report/15/ issued by the laboratory of Coal Mine Exploration of Guizhou Province during this monitoring period, CTI confirmed that the annual composition analysis report results show that PC _{NMHC} of all power plants is lower than 1%.		
Measurement method and procedures correctly described?	Yes –it is measured annually, the value is monitored by the laboratory of Coal Mine Exploration of Guizhou Province sampled at the inlet of gas analyser		
Calculation method?	N/A		
Monitoring frequency correctly described?	Yes – Annually		
Monitoring equipment correctly described?	N/A, it is tested by the Laboratory of Coal Mine Exploration of Guizhou Province		
QA/QC procedure correctly described?	Yes - the value is monitored by the laboratory of Coal Mine Exploration of Guizhou Province sampled at the inlet of gas analyser/15/ in accordance with “Analysis of natural gas by Gas Chromatography” (GB/T 13610-2014)/29/, which is a qualified and independent organization/24/.		
Purpose of data?	Calculation of project emission from NMHC destruction.		
Comments?	N/A		

In conclusion, CTI confirmed that all monitoring parameters have been measured / determined without material misstatements and in line with PDD, applied methodology, all applicable standards and relevant requirements.

CAR 02, CAR 03 and CAR 04 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

4.4.3 Assessment of in Compliance with monitoring plan

By means of comparison of the MR with the applied CDM methodology and all VCS standards' requirements.

The verification team has checked whether the monitoring implementation during this monitoring period is in compliance with the monitoring plan in PDD and related requirements of the applied methodology/tools.

The verification team has checked the monitoring system in MR against the applied methodology and monitoring plan of the PDD.

The monitoring system has been operated as per the monitoring plan in the PDD and monitoring manual/22/ as in compliance with the latest applicable version of the methodology (ACM0008 Version 07)/32/.

Data and parameters to be monitored as above tables are confirmed in line with the PDD and applied methodology, also corresponding to the formula used for ER calculation.

Monitoring structure

The PDD contains a diagram illustrating the Management structure of VCS monitoring to be implemented by the PP in order to implement the project activity. Via the MR and PDD, the monitoring team consists of the VCS Manager, monitoring officers and internal verifiers and by site interview with the monitoring representatives, CTI confirmed that the roles of the monitoring team have been clearly defined and the responsibilities have been implemented by monitoring team sufficiently. The organizational structure is considered sufficient to fulfil the monitoring requirements of the methodology and to ensure that emission reductions can be verified.

Monitoring process

Data and parameters to be monitored as above tables in section 4.4.2 are confirmed in line with the methodology and tool, also corresponding to the formula used for ER calculation.

The PDD contains a diagram illustrating the project monitoring diagram which is confirmed as consistent with the Gas and Power Wiring Diagram/20/ and verified as actual by site inspection.

Methane sent to the power generators **MM_{LEC}** and Concentration **PC_{CH4}** are measured continuously by the Flow meters (with temperature and pressure transmitter) and gas analysers. Flow meters (with temperature and pressure transmitter) and gas analysers are installed at each CMM power plant. **MM_{LEC}** is continuously measured and hourly recorded by DCS system automatically. The Flow meters (with temperature and pressure transmitter) and gas analysers monitors the Methane sent to the power generators. In addition, the calculation is done by the DCS system automatically. Via on-site investigation

and checking the MR, it is confirmed that there're two gas pipelines in power plant Jinjia Jinyi and Yueliangtian Nansan. Each gas pipeline is equipped with one flow meter. However only one gas analyzer installed in each of the two power plants. Via checking the explanation in the previous MR/6/, it is confirmed that one gas analyser is sufficient to measure the components and corresponding concentration (including methane concentration) of the CMM in the two gas pipelines because the methane concentration is the same in both pipelines. The meter installation of the two power plants is in accordance with the monitoring plan and the applied methodology, and the monitoring system can accurately monitor the amount and concentration of methane sent to the generator, and this method has been verified in previous verifications/6/.

Electricity generation by the project **GEN_y** and electricity consumption for the project activity **CONSELEC_{PJ}** is continuously monitored by bidirectional electric meters installed at each CMM power plant.

PC_{NMHC} is measured annually, the value is monitored by the laboratory.

CEF_{NMHC} is carbon emission factor for combusted non-methane hydrocarbons (various). If the concentration of NMHC **PC_{NMHC}** in the extracted gas is less than 1%, emission from NMHC destruction will be considered to be zero in the emission calculation according to ACM0008 (Version 07).

For other parameters, refer to above tables in section 4.4.2 for detail assessment of the monitoring method and process.

All monitoring devices were calibrated/23/ by qualified third parties/24/ in line with the national calibration standard and applied methodology and PDD.

QA/QC

The accuracy of all the monitoring devices is in line with the related requirements as confirmed in the calibration report/23/. Calibration of equipment has been implemented periodically by qualified party/24/ according to national standards and rules/23/. All the records have been documented by the PP.

The monitoring team was trained for basic conception and management of the project activity by checking the training records/19/, specific staff collected the measured methane values and electricity data regularly and complete the corresponding records, keeping all the data collected as part of monitoring archived electronically.

Internal audit was conducted by QA/QC manager for cross check all the data as described in above tables in section 4.4.2.

Emergency procedure

Monitoring team will take actions to deal with missing data due to negligence and improper operation and maintain or will replace the broken monitoring devices if any malfunction and the monitoring data will be calculated conservatively for emission calculations during the troubleshooting period.

By site interview with monitoring staff and experts and checking the related evidence for data/13/,/12/,/23/, CTI verified that no emergency situations have been occurred. Thus no emergency procedure was used for this monitoring period.

Data management

Via site inspection, CTI verified that all monitoring data are well kept with both electronic copy and hard copy. All data collected as part of monitoring will be archived and be kept at least for 2 years after the end of the crediting period.

Based on above assessment, CTI verified that the monitoring system complies with the applied methodology and the monitoring plan and all applied procedures are completely in compliance to the methodology ACM0008 (Version 07) and PDD.

4.4.4 Compliance with the calibration frequency requirements for measuring instruments

During the verification the relevant monitoring equipment has been checked whether the calibration requirements have been met; especially if the calibration frequency is in line with the requirements of the registered PDD/3/ and/or the applicable calibration standards.

The information of monitoring equipment used for monitoring in this monitoring period is listed in PDD and the calibration information has been assessed in above section 4.4.2 in each monitoring parameter table.

Furthermore, via checking the certificate of third party who conducted the calibration/24/, CTI confirmed that the third party get the related qualification.

In conclusion, the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan in PD. Based on that CTI can confirm that all installed monitoring equipment has been duly calibrated for this entire monitoring period.

4.4.5 Assessment of data and calculation of emission reductions or net removals

4.4.5.1 Calculation of baseline GHG emissions or removals

According to the methodology and registered PDD, BE is calculated as below

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

Where:

BE_y	=	Baseline emissions in year y (tCO ₂ e)
$BE_{MD,y}$	=	Baseline emissions from destruction of methane in the baseline scenario in year y (tCO ₂ e)
$BE_{MR,y}$	=	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
$BE_{Use,y}$	=	Baseline emissions from the production of power replaced by the project activity in year y (tCO ₂ e).

i. $BE_{MD,y}$

Via checking the PDD, it is confirmed that 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.

ii. $BE_{MR,y}$

$$BE_{MR,y} = GWP_{CH_4} \times [(CMM_{PJ,y} - CMM_{BLi,y}) + (PMM_{PJ,y} - PMM_{BLi,y})] \quad (2)$$

Where:

$CMM_{PJ,y}$	=	Pre-mining CMM captured, sent to and destroyed by power generation in the project activity in year y (expressed in tCH ₄); not distinguishable from $PMM_{PJ,y}$
$CMM_{BLi,y}$	=	Pre-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (expressed in tCH ₄)
$PMM_{PJ,y}$	=	Post-mining CMM captured, sent to and destroyed by power generation in the project activity in year y (tCH ₄); not distinguishable from $CMM_{PJ,y}$
$PMM_{BLi,y}$	=	Post-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH ₄)
GWP_{CH_4}	=	Global warming potential of methane (28 tCO ₂ e/tCH ₄)

According to the PDD, it is confirmed that in the baseline scenario, there is no CMM captured, sent to and destroyed, thus $CMM_{BLi,y}$ and $PMM_{BLi,y}$ is 0; $CMM_{PJ,y}$ and $PMM_{PJ,y}$ are together directly monitored and measured, which is the same as MM_{ELEC} , given that the common extraction system is located in the underground mine.

During this monitoring period, based on the above assessment in section 4.4.2, 4.4.3 and 4.4.4, CTI verified that the $BE_{MR,y}$ for this monitoring period as below table

Table 4-1 $BE_{MR,y}$ calculation during this monitoring period

Year	MM_{ELEC} (tCH ₄)	GWP_{CH_4} (tCO ₂ e/ tCH ₄)	$BE_{MR,y}$ (tCO ₂ e)
26-December-2019~31-December-2019	276.89	28	7,752
01-January-2020~31-December-2020	13,224.44	28	370,284
01-January-2021~31-March-2021	3,286.40	28	92,019
Total	16,787.74	-	470,055

iii. $BE_{Use,y}$

As per the PDD and applied methodology, it is calculated as below formular,

$$BE_{Use,y} = (GEN_y - CONS_{ELEC,PJ}) \times EF_{ELEC} + HEAT_y \times EF_{HEAT} + VFUEL_y \times EF_v \quad (3)$$

Where:

GEN_y	=	Electricity generated by project activity in year y (MWh)
$CONS_{ELEC,PJ}$	=	Additional electricity consumption for capture and use or destruction of methane, i any (MWh)
EF_{ELEC}	=	Emissions factor of electricity replaced by project (tCO ₂ /MWh)
$HEAT_y$	=	Heat generation by project activity in year y (GJ), including through the use of CBM
EF_{HEAT}	=	Emissions factor for heat production replaced by project activity (tCO ₂ /GJ)
$VFUEL_y$	=	Vehicle fuel provided by the project activity in year y (GJ)
EF_v	=	Emissions factor for vehicle operation replaced by project activity (tCO ₂ /GJ)

According to the PDD and via on-site investigation, it is confirmed that the project does generate heat and provide vehicle fuel, hence

$$BE_{Use,y} = (GEN_y - CONSELEC,PJ) \times EF_{ELEC} \quad (4)$$

During this monitoring period, based on the above assessment in section 4.4.2, 4.4.3 and 4.4.4, CTI verified that the $BE_{Use,y}$ for this monitoring period as below table

Table 4-2 $BE_{Use,y}$ calculation during this monitoring period

Year	GEN _y (MWh)	CONSELEC,PJ (MWh)	EF _{ELEC} (tCO ₂ e/MWh)	BE _{Use,y} (tCO ₂ e)
26-December-2019~31-December-2019	1,363.632	3.168	0.7134	970
01-January-2020~31-December-2020	69,025.968	122.064	0.7134	49,156
01-January-2021~31-March-2021	17,916.576	25.176	0.7134	12,763
Total	88,306.176	150.408	-	62,889

Hence, based on the formular (1), the total baseline emission for this monitoring period is calculated as shown in below table

Table 4-3 Baseline Emission calculation during this monitoring period

Year	BE _{MD,y} (tCO ₂ e)	BE _{MR,y} (tCO ₂ e)	BE _{Use,y} (tCO ₂ e)	BE _y (tCO ₂ e)
26-December-2019~31-December-2019	0	7,752	970	8,722
01-January-2020~31-December-2020	0	370,284	49,156	419,440
01-January-2021~31-March-2021	0	92,019	12,763	104,782
Total	0	470,055	62,889	532,944

In conclusion, the calculations of baseline GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in baseline GHG emissions have been justified. Appropriate GWP and emission factor values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified. It can be confirmed that the baseline emission calculation is overall correct.

CL 03 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

4.4.5.2 Calculation of project GHG emissions or actual net GHG removals by sinks

According to the PDD and methodology, the project emissions is calculated using the following formula:

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

Where:

- PE_y = Project emissions in year y (tCO₂e)
- PE_{ME} = Project emissions from energy use to capture and use methane (tCO₂e)
- PE_{MD} = Project emissions from methane destroyed (tCO₂e)
- PE_{UM} = Project emissions from un-combusted methane (tCO₂e)

i. PE_{ME} ,

According to the PDD, it is confirmed that there is no additional energy required for CMM capture compared with the baseline scenario, this is also verified via the on-site investigation. Hence, $PE_{ME}=0$.

ii. PE_{MD}

According to the PDD and methodology, it is confirmed that the project emission generated when the captured methane is utilized or oxidized.

In addition, if NMHC account for more than 1% by volume of the extracted CMM, combustion emission from these gases should also be included.

$$PE_{MD} = (MD_{FL} + MD_{OX} + MD_{ELEC} + MD_{HEAT} + MD_{GAS}) \times (CEF_{CH_4} + r \times CEF_{NMHC}) \quad (6)$$

And $r = PC_{NMHC} / PC_{CH_4}$

Where:

MD_{FL}	=	Methane destroyed through flaring (tCH ₄)
MD_{OX}	=	Methane destroyed through flameless oxidation (tCH ₄)
MD_{ELEC}	=	Methane destroyed through power generation (tCH ₄)
MD_{HEAT}	=	Methane destroyed through heat generation (tCH ₄)
MD_{GAS}	=	Methane destroyed after being supplied to gas grid or for vehicle use (tCH ₄)
CEF_{CH_4}	=	Carbon emission factor for combusted methane (2.75 tCO ₂ /tCH ₄)
r	=	Relative proportion of NMHC compared to methane
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)
PC_{CH_4}	=	Concentration (in mass) of methane in extracted gas (%), measured on wet basis
PC_{NMHC}	=	NMHC concentration (in mass) in extracted gas (%)

According to the PDD and via on-site investigation/31/, it is confirmed that the Project doesn't involve flaring, flameless oxidation, heating and supplying to gas grid, thus MD_{FL} , MD_{OX} , MD_{HEAT} and MD_{GAS} is 0.

While via checking the annual NMHC concentration analysis report dated 26-April-2020 and 06-January-2021/15/, it is confirmed that the concentration of NMHC accounts for less than 1% by volume of extracted coal mine gas, thus emission from NMHC destruction is not considered.

Therefore,

$$PE_{MD} = MD_{ELEC} \times CEF_{CH_4} \quad (7)$$

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

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

Where:

MM_{ELEC}	=	Methane measured sent to power plant (tCH ₄)
Eff_{ELEC}	=	Efficiency of methane destruction/oxidation in power plant (taken as 99.5% from (IPCC))

During this monitoring period, based on the above assessment in section 4.4.2, 4.4.3 and 4.4.4, CTI verified that the PE_{MD} for this monitoring period as below table

Table 4-4 PE_{MD} calculation during this monitoring period

Year	MM_{ELEC} (tCH ₄)	Eff_{ELEC} (%)	CEF_{CH_4} (tCO ₂ /tCH ₄)	PE_{MD} (tCO _{2e})
26-December-2019~31-December-2019	276.89	99.5	2.75	758
01-January-2020~31-December-2020	13,224.44	99.5	2.75	36,186

01-January-2021~31-March-2021	3,286.40	99.5	2.75	8,993
Total	16,787.74	-	-	45,937

iii. PE_{UM}

According to the PDD and on-site interview with the operation staff, it is confirmed that not all the methane used for power generation is combusted, a small percentage escaped to the atmosphere. Hence, it is calculated as below formular,

$$PE_{UM} = GWP_{CH_4} \times MM_{ELEC} \times (1 - Eff_{ELEC}) + PE_{flare} + PE_{OX} \times GWP_{CH_4} \quad (8)$$

Where:

- GWP_{CH_4} = Global warming potential of methane (25 tCO₂e/tCH₄)
- MM_{ELEC} = Methane measured sent to power plant (tCH₄)
- Eff_{ELEC} = Efficiency of methane destruction/oxidation in power plant (taken as 99.5% from (IPCC))
- PE_{flare} = Project emissions of non-combusted CH₄ expressed in terms of CO₂e from flaring of the residual gas stream (tCO₂e)
- PE_{OX} = Project emissions of non-oxidized CH₄ from flameless oxidation of the VAM stream (tCH₄)

As per the PDD, $PE_{flare}=0$ and $PE_{OX}=0$.

Thus,

$$PE_{UM} = GWP_{CH_4} \times MM_{ELEC} \times (1 - Eff_{ELEC}) \quad (8)$$

During this monitoring period, based on the above assessment in section 4.4.2, 4.4.3 and 4.4.4, CTI verified that the PE_{UM} for this monitoring period as below table

Table 4-5 PE_{UM} calculation during this monitoring period

Year	MM_{ELEC} (tCH ₄)	Eff_{ELEC} (%)	GWP_{CH_4} (tCO ₂ e/ tCH ₄)	PE_{UM} (tCO ₂ e)
26-December-2019~31-December-2019	276.89	99.5	28	39
01-January-2020~31-December-2020	13,224.44	99.5	28	1,852
01-January-2021~31-March-2021	3,286.40	99.5	28	461
Total	16,787.74	-	-	2,352

Hence, based on the formular (5), the total project emission for this monitoring period is calculated as shown in below table

Table 4-6 PE_y calculation during this monitoring period

Year	PE_{ME} (tCO ₂ e)	PE_{MD} (tCO ₂ e)	PE_{UM} (tCO ₂ e)	PE_y (tCO ₂ e)
26-December-2019~31-December-2019	0	758	39	797
01-January-2020~31-December-2020	0	36,186	1,852	38,038
01-January-2021~31-March-2021	0	8,993	461	9,454
Total	0	45,937	2,352	48,289

In conclusion, the calculations of project GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized project. Any assumptions used in project GHG emissions have been justified. Appropriate GWP and emission factor values have been correctly applied. No errors,

miscalculations, omissions, misstatements or incomplete information has been identified. It can be confirmed that the project emission calculation is overall correct.

4.4.5.3 Calculation of leakage GHG emissions

In accordance with the PDD and methodology, the leakage is calculated as below,

$$LE_y = LE_{d,y} + LE_{o,y} \quad (9)$$

Where

- LE_y = Leakage emissions in year y (tCO₂e);
- $LE_{d,y}$ = Leakage emissions due to displacement of other baseline thermal energy uses of methane in year y (tCO₂e);
- $LE_{o,y}$ = Leakage emissions due to other uncertainties in year y (tCO₂e).

Since the baseline scenario does not include thermal energy use, hence $LE_{d,y} = 0$

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

According to the PDD/3/ and methodology/32/,

The leakage of the proposed project activity will not result from:

- Impact of CDM project activity on coal production – the CDM project activity is not designed to affect the on-going coal production, with the gas extraction and ventilation systems as part of the baseline scenario, and therefore leakage from this is zero;
- Impact of CDM project activity on coal prices and market dynamics – according to the methodology ACM0008 (Version 07), the proposed project is considered having no impact on coal price and market dynamics ex-ante, unless the EB instruct otherwise in future.

Therefore, there is no leakage caused by the project activity for this monitoring period, i.e. $LE_y = 0$.

4.4.5.4 Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

The verification team has checked the MR includes a summary table of the emission reductions calculation.

Summary of emission reductions during the monitoring period,

$$ER_y = BE_y - PE_y - LE_y \quad (10)$$

Hence, the emission reductions during this monitoring period are summarized in the table below

Table 4-7 Emission Reductions Calculation during this monitoring period

Parameters Period	Baseline Emissions BE_y	Project Emissions PE_y	Leakage Emissions LE_y	Net GHG emission reductions or removals ER
	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)
26-December-2019~31-December-2019	8,722	797	0	7,925
01-January-2020~31-December-2020	419,440	38,038	0	381,402
01-January-2021~31-March-2021	104,782	9,454	0	95,328

Total	532,944	48,289	0	484,655
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All the figures as per the monitoring report were cross-checked by the verification team against basic monitored data. Refer to section 4.4.1 and 4.4.2 of this report for assessment details.

Via checking the values in MR/1/ against the ER calculation sheet/2/, CTI confirmed that the emission reductions calculation is overall correct.

4.4.5.5 Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PD

The comparison of actual values of the monitoring period with the estimations in the registered PDD has been carried out by VVB.

As per the PD/4/, VVB confirmed that the annual estimated emission reduction is 431,778 tCO₂e, thus the estimated emission reduction in 2019 (covering 6 days) is 7,097 tCO₂e, i.e. $7,097 \text{ tCO}_2\text{e} = 431,778 \text{ tCO}_2\text{e} \times 6\text{days}/365\text{days}$. And the emission reduction in 2020 is 431,778 tCO₂e, the emission reduction in 2021 is 106,466 tCO₂e, i.e. $106,466 \text{ tCO}_2\text{e} = 431,778 \text{ tCO}_2\text{e} \times 90\text{days}/365\text{days}$, so the estimated emission reduction in this monitoring period is 545,341 tCO₂e. The actual emission reductions in this monitoring period are 484,655 tCO₂e, which is 11.13% less than the estimation in the registered PD/4/.

Via checking the PDD/3/, CTI confirmed that ex-ante calculations using GWP_{CH₄} value from the IPCC Fourth Assessment Report (AR4) which is 25tCO₂e/tCH₄, while as per the VCS Standard 4.1, ex-post calculations using GWP_{CH₄} value from the IPCC Fifth Assessment Report (AR5)/34/ which is 28 tCO₂e/tCH₄. Furthermore, due to power plant Xiangshui Botu has not been built yet, it would be conservative to exclude the estimated emission reduction of Xiangshui Botu for this monitoring period. The current installed capacity is 14.2MW, and the designed total installed capacity is 17.7MW (including Xiangshui Botu).

Hence the estimated emission reductions for this monitoring period excluding Xiangshui Botu power plant and the change of GWP_{CH₄} value are 490,005 tCO₂e ($=545,341 \text{ tCO}_2\text{e} \times 14.2\text{MW}/17.7\text{MW} \times 28 \text{ tCO}_2\text{e}/\text{tCH}_4/25 \text{ tCO}_2\text{e}/\text{tCH}_4$). Then the actual emission reductions achieved during this monitoring period is only 1.09% $(484,655 \text{ tCO}_2\text{e} - 490,005 \text{ tCO}_2\text{e})/490,005 \text{ tCO}_2\text{e}$ lower than the estimated emission reductions which is verified as reasonable by considering the fluctuation of project operation for this type.

PP has listed the comparison result in the MR/1/ and ER sheet/2/, and the related reason has been clarified in the MR which is verified by CTI as correct and reasonable.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Refer to section 4.4 above for the detail assessment of each monitoring parameters and Appendix 3 for the supporting evidence used to determine the GHG emission reductions.

For each reported data, the evidence is provided and verified as sufficient and quality is appropriate. Also, the cross-checks have been performed on the reported data with different source of evidence. The information flow from data generation and aggregation, to recording, calculation and final transposition into the monitoring report has been assessed by VVB in section 4.4 for each parameter and the calibration have been conducted as per the frequency of monitoring equipment defined in the registered PDD.

Therefore, it is concluded that the evidence provided are verified as sufficient and quality is appropriate and thus the evidence can be used to determine the GHG emission reductions and removals for this monitoring period.

4.6 Non-Permanence Risk Analysis

N/A

5. VERIFICATION CONCLUSION

Climate Bridge (Shanghai) Ltd. has commissioned the Shenzhen CTI International Certification Co., Ltd to carry out the Verified Carbon Standard (VCS) 2nd periodic verification of the project activity Guizhou Panjiang Low Concentration Coal Mine Methane Power Generation Project Phase 2, VCS Ref. No. 2291 for the period 26-December-2019 to 31-March-2021, with regard to the relevant requirements for VCS Version 4.1.

Based on the documented evidence and corroborated by an on-site assessment, CTI can confirm that:

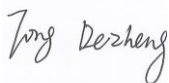
- the project has been implemented and operated as per the registered PDD;
- there is no project description deviation identified for this monitoring period;
- the project complies with the verification criteria for projects set out in VCS Version 4.1;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS requirement;
- the monitoring is in place as per the applied monitoring methodology;
- the monitoring complies with the monitoring plan in the validated PDD;

It is certified that the GHG emission reductions from the project during the monitoring period amount as follows:

Verification period: From 26-December-2019 to 31-March-2021

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline Emissions BE_y	Project Emissions PE_y	Leakage Emissions LE_y	Net GHG emission reductions or removals ER
	(tCO _{2e})	(tCO _{2e})	(tCO _{2e})	(tCO _{2e})
26-December-2019~31-December-2019	8,722	797	0	7,925
01-January-2020~31-December-2020	419,440	38,038	0	381,402
01-January-2021~31-March-2021	104,782	9,454	0	95,328
Total	532,944	48,289	0	484,655



Dezheng Tong
CTI
Verification Team Leader
29-October-2021



Zhou Lu
CTI
Final Approval
29-October-2021

APPENDIX 1: ABBREVIATIONS

Abbreviations	Full texts
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CP	Certification Program // Crediting Period
CSPG	China Southern Power Grid
DverR	Draft Verification Report
EIA	Environmental Impact Assessment
ER	Emission Reduction
ETS	Emission Trading Scheme
FAR	Forward Action Request
FverR	Final Verification Report
GHG	Greenhouse gas(es)
GS	Gold Standard
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
PA	Project Activity
PD	Project Description
PP	Project Participant
PPA	Power Purchase Agreement
QA/QC	Quality Assurance / Quality Control
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit
VVB	Validation/Verification Body

APPENDIX 2: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Mr. Dezheng TONG

Team Leader(TL) and verifier

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	√	√	√	√	-	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 8: Mining/mineral production	TA 8.1: Mining/mineral production
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1: Fugitive emissions from oil and gas

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements f management system of the Certification Body of CTI.

Approved by:

Wu Lin

Wu LIN

Technical Competent Manager

Shenzhen, 01/07/2019

Mr. Wu LIN

Technical Reviewer (TR)

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification					
GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
√	√	√	√	√	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation
	TA 1.2: Energy generation from renewable energy sources
SS 2: Energy distribution	TA 2.1: Electricity distribution
SS 3: Energy demand	TA 3.1: Energy demand
SS 4: Manufacturing industries	TA 4.1: Cement and lime production
SS 5: Chemical industry	TA 5.1: Chemical industry
	TA 5.2: Caprolactam, nitric and adipic acid
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1: Fugitive emissions from oil and gas
SS 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	TA 11.1: Emissions of fluorinated gases
	TA 11.2: Refrigerant gas production
SS 12: Solvents use	TA 12.1: Chemical industry
SS 13: Waste handling and disposal	TA 13.1: Solid waste and wastewater
	TA 13.2: Manure

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:
Lu ZHOU



General Manager

Shenzhen, 01/01/2021

Ms. Shu'E JIANG

Technical Expert(TE) for Technical Reviewer (TR)

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	-	-	-	-	-	√

Scope	Technical Area
SS 6: Construction	TA 6.1: Construction
SS 8: Mining/mineral production	TA 8.1: Mining/mineral production
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1: Fugitive emissions from oil and gas

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by: *Wu Lin*

Wu LIN

Technical Competent Manager

Shenzhen, 01/01/2021

APPENDIX 3: DOCUMENTS REVIEWED OR REFERENCED

No	Author	Title	References to the document	Provider
1.	Climate Bridge (Shanghai) Ltd.	Monitoring Report	Monitoring Report for the 2 nd monitoring period Draft version 1.0, dated 04-August-2021 Version 2.0, dated 08-September-2021 Final version 3.0, dated 29-October-2021	Project Owner
2.	Climate Bridge (Shanghai) Ltd.	Emission Reduction Calculation Sheet	Emission Reduction Calculation sheets (related to MR) Draft version 1.0, dated 04-August-2021 Final version 2.0, dated 08-September-2021	Project Owner
3.	Climate Bridge (Shanghai) Ltd.	Project Design Document	Latest Approved CDM Project Design Document for project: “Guizhou Panjiang Low Concentration Coal Mine Methane Power Generation Project Phase 2” version 06, dated 05-July-2013	Project Owner
4.	Climate Bridge (Shanghai) Ltd.	Project Description	VCS approved Project Description (PD) for the project, Version 3.0, dated 17-August-2020	Project Owner
5.	Rina	Validation report	Validation Report for CDM project “Guizhou Panjiang Low Concentration Coal Mine Methane Power Generation Project Phase 2” version 2.0, dated 14/11/2012	VERRA website
6.	DOEs	Verification Reports	1 st to 5 th CDM periodic verifications: MRs and Verification Reports Refer to https://cdm.unfccc.int/Projects/DB/RINA1344437738.67/view 1 st VCS periodic verification: MR and Verification Reports Refer to https://registry.terra.org/app/project/Detail/45/2291	UNFCCC and VERRA website
7.	Panjiang County Industrial and Commercial Bureau	Business License	Business License of Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Project Owner
8.	Guizhou Environmental Science Research and Design Institute:	Environmental Impact Assessment	EIA designed by Guizhou Environmental Science Research and Design Institute on 11-October-2010	Project Owner

No	Author	Title	References to the document	Provider
9.	Guizhou Province Environmental Protection Bureau	EIA approval	EIA approval of Guizhou Panjiang CMM Power Generation Project Phase 2, dated 09-February-2011	Project Owner
10.	Guizhou Panjiang CBM Development & Utilization Co., Ltd. Project Department	Report of acceptance of completed project	Report of acceptance of completed project of each CMM power plant	Project Owner
11.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Meter Reading Records	Monthly Meter reading records of all the electricity meters covering this monitoring period Daily Meter reading records of all the electricity meters covering the period from 26-March-2021 to 31-March-2021	Project Owner
12.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Electricity transaction notes	Monthly electricity transaction notes issued by project owner covering this monitoring period	PP
13.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Gas Monthly Data	Gas Monthly Data covering this monitoring period - Monthly gas flow reports via flow meters, pressure transmitters and temperature transmitters of F1~F4 and F1', F3' - Daily gas flow reports via flow meters, pressure transmitters and temperature transmitters of F1~F4 and F1', F3' for the period from 26-March-2021 to 31-March-2021	Project Owner
14.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	CH ₄ concentration of CMM	Hourly CH ₄ concentration data of CMM measured by gas analyzers of C1~C4	Project Owner
15.	Laboratory of Coal Mine Exploration of Guizhou Province	Concentration analysis report of the extracted gas	Concentration analysis report of the extracted gas for determine the PC_{NMHC} dated 26-April-2020 and 06-January-2021 covering this monitoring period	Project Owner
16.	Guizhou Panjiang Coal Mine Co., Ltd.	CH ₄ concentration statement	CH ₄ concentration statement of Xiangshui Botu mining areas	Project Owner
17.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	LOG	- Sample copy of project operation records - Equipment daily check log - Equipment mandatory maintenance records	Project Owner

No	Author	Title	References to the document	Provider
18.	Shangdong Oil Field Shengli Power Machinery Group Co. Ltd.	Technical Particulars of equipment	Technical Particulars and purchase agreement of Gas Engine Generator	Project Owner
19.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Training and Competence Records	Project Responsibilities, Training and Competence Records - Project Organization Chart and responsibilities - Staff Training Records of each CMM power plant - Operator Certificates of each CMM power plant - Internal audit record covering this monitoring period	Project Owner
20.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Gas and Power Wiring Diagram	Gas and Power Wiring Diagram of each CMM power plant derived from the DCS system of each CMM power plant	Project Owner
21.	Guizhou Panjiang CBM Development & Utilization Co., Ltd. and Guizhou Panjiang Coal Mine Co., Ltd.	Power Purchase and Sale Contract	Power Purchase and Sale Contract signed by both parties valid for year 2019 to 2021.	Project Owner
22.	Guizhou Panjiang CBM Development & Utilization Co., Ltd.	Monitoring Manual	Monitoring Manual for the project activity and CDM project site management rules and regulations for each CMM power plant involved	Project Owner
23.	Liuzhi Working Condition (Group) Measurement and Testing Institute	Calibration certificates	Calibration Certificates for meters M1~M4 on 31-August-2019	PP
	Testing centre of Guizhou Panjiang CBM Development & Utilization Co., Ltd.		Calibration Certificates for meters M1~M4 on 30-August-2020	
	Chongqing Testing Centre of Science & Technology		Calibration Certificates for gas flow meters, pressure transmitter and temperature transmitter F1~F4 and F1', F3' covering monitoring period	
	National Station of Mining Safety Metrology		Calibration Certificates for gas analyzers C1~C4 covering monitoring period	
24.	China National Accreditation		Certificate of metrological authorization to Chongqing Testing	PP

No	Author	Title	References to the document	Provider
	Service for Conformity Assessment	Certificate of Metrological Authorization	Center of Science & Technology, No. CNAS L1074 valid from 18-August-2017 to 17-August-2023	
	Liupanshui Quality Technology Supervision Bureau		Certificate of Metrological Authorization to Testing centre of Guizhou Panjiang CBM Development & Utilization Co., Ltd., valid from 25-November-2017 to 24-November-2021, [2017] Qianliuliangbiao200905	
	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China		Certificate of Metrological Authorization to National Station of Mining Safety Metrology, No. Guoliangbiao (1991) 041 valid from 10-August-2017 to 09-August-2021	
	China National Accreditation Service for Conformity Assessment		Certificate of Metrological Authorization to Laboratory of Coal Mine Exploration of Guizhou Province, No. 162417340256, valid from 21-April-2016 to 20-April-2022	
	Liupanshui City Market Supervision Administration		Certificate of Metrological Authorization to Liuzhi Working Condition (Group) Measurement and Testing Institute, issued on 13-January-2016, valid to 12-January-2020 and issued on 11-January-2020, valid to 10-January-2024	
25.	Project Owner and local stakeholder	Local stakeholder consultation records	local stakeholder communication survey questionnaires conducted in May 2020	Project Owner
26.	PP and staffs	Employment contracts	Employment contracts	PP
27.	PP	Payroll	Monthly payroll to the plant staffs	PP
28.	General Administration of Quality Supervision, Inspection and Quarantine	JJG640-2016	Verification regulation of different pressure type flow meter	Public website
29.	General Administration of Quality Supervision, Inspection and Quarantine	GB/T 13610- 2014	Analysis of natural gas by Gas Chromatography (GB/T 13610-2014)	Public website
30.	National Energy Bureau	DL/T 448-2016	Technical Administrative Code of Electric Energy Metering (DL/T 448-2016)	Public website

No	Author	Title	References to the document	Provider
31.	On-site verification team	Photographs of Project Site	Photographs of this CMM power plant site, Central Control Room, DCS System, all the meters and nameplate of the equipment taken by verification team during the on-site verification	On-site Verification team
32.	UNFCCC	Applied methodology	Approved CDM methodology ACM0008: "Consolidated 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 through flaring or flameless oxidation" (Version 07)	UNFCCC Website
33.	UNFCCC	Tool	"Tool to calculate the emission factor for an electricity system" (version 02.2.1)	UNFCCC Website
34.	IPCC	AR5	IPCC Fifth Assessment Report (AR5)	IPCC website
35.	VERRA	Monitoring Report Template	VCS- Monitoring-Report -Template-v4.0	VERRA
36.	VERRA	Registration and Issuance Process version 4.0	Registration and Issuance Process version 4.0	VCS website
37.	VERRA	VCS Program Definitions	VCS Program Definitions, v4.1	VCS website
38.	VERRA	VCS Program Guide	VCS Program Guide, v4.0	VCS website
39.	VERRA	VCS Standard	VCS Standard, v4.1	VCS website
40.	China CER Exchange Info-platform	China CER	http://cdm.ccchina.org.cn/ccer.aspx	Website
41.	Google	Google Earth Map	earth.google.com	Website
42.	GS	Gold Standard	http://www.goldstandard.org/	Website
43.	Intergovernmental Panel on Climate Change	IPCC Guidelines	2016 IPCC Guidelines for National Greenhouse Gas Inventories: work book	www.ipcc-nggip.iges.or.jp
44.	UNFCCC	UNFCCC	http://cdm.unfccc.int	Website
45.	VCS	VCS	https://verra.org/project/vcs-program/	Website
46.	Ministry of Ecology and Environment of China	China cap & trade scheme	http://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202101/t20210105_816131.html	Public Website
47.	Ministry of Ecology and Environment of China	Enforced company list	http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf	Public Website
48.	UNFCCC	CDM dedicated website for project	https://cdm.unfccc.int/Projects/DB/RINA1344437738.67/view	UNFCCC Website

APPENDIX 4: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUESTS

Table 1. Remaining FAR from validation and/or previous verification

FAR ID	N/A	Section no.	Date:
Description of FAR			
Project participant response			Date:
Documentation provided by project participant			
VVB assessment			Date:

Table 2. CL from this verification

CL ID	01	Section no.	1.1	Date : 20/08/2021
Description of CL				
In section 1.1,				
1. It is observed that the start time of this monitoring period is not clarified clearly by considering last monitoring period ended time.				
2. PP stated that “during this monitoring period, all power plants ran continuously”, however, Botu has not been operated until the site verification, clarification is requested.				
Project participant response				Date : 08/09/2021
1. This monitoring period is the second VCS monitoring period started from 08:00 25-December-2019, which has been clarified in updated MR.				
2. Power plant Xiangshui Botu has not started construction yet due to low methane concentration in the CMM gas stream extracted from the coal mine. Xiangshui Botu power plant will be constructed in the future if the methane concentration reaches 6% and keep stable after continuous monitoring, which has been clarified in updated MR.				
Documentation provided by project participant				
/1/- version 2.0				
/16/				
VVB assessment				Date: 09/09/2021
1. The revised MR is checked, CTI confirmed that monitoring time has been clarified in the MR. Via checking the 1 st VCS verification report and MR, it is confirmed that this monitoring period starts from 08:00 of 25-December-2019 as last monitoring period (1 st VCS) ended at 08:00 of 25-December-2019. The emission reductions achieved from 08:00 to 24:00 of 25-December-2019 are claimed in this monitoring period.				
2. The revised MR is checked, CTI confirmed that the clarification is provided. In accordance with the latest approved CDM PDD/3/, there are total 30 sets of CMM power generators with the total installed capacity of 17.7MW will be installed to utilize CMM for power generation. Via on-site investigation/31/ and checking the previous verification report/6/, it is confirmed that 24 sets of CMM power generators with total installed capacity of 14.2MW have been installed before the start of this monitoring period. Power Plant Xiangshui Botu has not started construction yet due to low methane concentration in the CMM gas stream extracted from the coal mine, this is verified by checking the CH ₄ concentration statement of Xiangshui Botu mining areas/16/. Xiangshui Botu power plant will be constructed in the future if the methane concentration reaches 6% and keep stable after continuous monitoring. Hence except Botu, all				

the other power plants ran continuously during this monitoring period.
CL 01 is closed.

CL ID	02	Section no.	1.9	Date : 20/08/2021
Description of CL				
The issued VCU quantities and corresponding period of VCS program is not clarified in section 1.9.				
Project participant response				Date : 08/09/2021
The issued VCU quantities and corresponding period of VCS program has been clarified in updated MR.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 09/09/2021
The revised MR is checked, CTI confirmed that the information has been added. CTI confirmed that GHG emission reductions of 627,061 tCO ₂ e generated from 26-February-2018 to 25-December-2019 by the project has been issued as VCUs under VCS program/45/. CL 02 is closed.				

CL ID	03	Section no.	5.1	Date : 20/08/2021
Description of CAR				
It is observed that for the period from 26-March-2021 to 31-March-2021, due to the monitoring time is not the 24:00 of last each month, so how to get the data for this period is not clarified for related table in MR.				
Project participant response				Date : 08/09/2021
The electricity transaction cut-off date is 8:00 on the 25 th of each month, and the data from December 26 th to December 31 st is provided by the grid company, which has been clarified in updated MR.				
Documentation provided by project participant				
/1/- version 2.0 /11/				
VVB assessment				Date: 09/09/2021
The revised MR is checked, CTI confirmed that the clarification has been added. The value from December 26 th to December 31 st is provided by the grid company/11/ and has been verified by CTI, it is confirmed that the data is correct. CL 03 is closed.				

Table 3. CAR from this verification

CAR ID	01	Section no.	2.2	Date : 20/08/2021
Description of CAR				
The detail information of the questionnaire survey for the local stakeholder to collect the relevant comments and suggestions in May 2020 is not provided.				
Project participant response				Date : 08/09/2021
The detail information of the questionnaire survey for the local stakeholder to collect the relevant comments and suggestions in May 2020 has been provided in updated MR.				
Documentation provided by project participant				
/1/- version 2.0 /25/				
VVB assessment				Date: 09/09/2021

The revised MR is checked, CTI confirmed that the information has been provided. Via checking the filled 40 questionnaires/25/, interview with the local officer and local resident during site visit, it is verified that Seventy five percent of the respondents believe that the Project will not have any environmental impact, but there are a few respondents who show their concern about the potential noise pollution and water pollution caused by the Project. Project Owner explained about this in the stakeholder meeting and brought up with corresponding approaches to minimize the impact of the Project on the environment which has been verified by interview with local officer, the local officer from Panjiang City Environment Protection Bureau Environmental Monitoring Team has confirmed that the project was under supervised and the implementation of the project is in line with the local environment protection regulations. And via checking the filled 40 questionnaires/25/, it is confirmed that no one thinks that the Project will have a negative impact on the local life. Hence there is no need to change the project design based on the stakeholder inputs and CTI confirmed that all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals which in compliance with the VCS requirements. CAR 01 is closed.

CAR ID	02	Section no.	4.2	Date : 20/08/2021
Description of CAR				
For monitored parameter MM_{ELEC} , the function of each monitoring device and how to measure the MM_{ELEC} by flow meters, Pressure Transmitters, Temperature Transmitters and gas analyzers is not specified.				
Project participant response				Date : 08/09/2021
The computer system automatically monitors and records relevant meters data. The concentration (in mass) of methane in extracted gas (PC_{CH_4}) is monitored by gas analysers. The methane sent to the power generators (MM_{ELEC}) is calculated based on gas flow rate, pressure, temperature measured by flow meters and methane concentration of CMM measured by gas analysers. The monitored hourly data of gas flow rate, pressure, temperature and CH_4 concentration are automatically collected and recorded by the DCS system. The DCS system then converts the monitored pressure and temperature to reference conditions (1 atm and 20°C) and calculates the hourly value of MM_{ELEC} , which has been clarified in updated MR.				
Documentation provided by project participant				
/1/- version 2.0 /13/				
VVB assessment				Date: 09/09/2021
The revised MR is checked, CTI confirmed that the related information has been provided. Flow meters (with temperature and pressure transmitter) and gas analysers are installed at each CMM power plant. MM_{ELEC} is continuously measured and hourly recorded by DCS system automatically. The MM_{ELEC} is calculated based on the value of gas flow rate, pressure, temperature measured by flow meters and CH_4 concentration of CMM measured by gas analysers. The calculation is done by the DCS system automatically. The Flow meters (with temperature and pressure transmitter) and gas analysers monitors the Methane sent to the power generators. And the calculation is done by the DCS system automatically. The meter readings and calculation result are recorded by the operation staff of each CMM power plant daily and aggregated monthly. Meanwhile, the automatic monitoring DCS system of each CMM power plant collects the data from the meters every day and delivers them to the project owner/13/. The PP gather all the values from 4 CMM power plants and get the total value of MM_{ELEC} CAR 02 is closed.				

CAR ID	03	Section no.	4.2	Date : 20/08/2021
Description of CAR				
For monitored parameter $CONS_{ELEC,PJ}$ and GEN_y , the QA/QC for data cross-check is missing.				
Project participant response				Date : 08/09/2021

For monitored parameter $CON_{ELEC,PJ}$ and GEN_y , the QA/QC for data cross-check has been added in updated MR.	
Documentation provided by project participant	
/1/- version 2.0 /12/ /11/	
VVB assessment	Date: 09/09/2021
The revised MR is checked, CTI confirmed that the QA/QC for data cross-check is added accordingly. Refer to section 4.4.2 of this report for detail assessment of each parameter. CAR 03 is closed.	

CAR ID	04	Section no.	4.2	Date : 20/08/2021
Description of CAR				
For monitored parameter PC_{CH_4} , the calculation method of weighted average of the month is not specified.				
Project participant response				Date : 08/09/2021
For monitored parameter PC_{CH_4} , monthly value is weighted average of daily methane sent to the power generators and methane concentration, which has been clarified in updated MR.				
Documentation provided by project participant				
/1/- version 2.0 /14/				
VVB assessment				Date: 09/09/2021
The revised MR is checked, CTI confirmed that the method applied is provided. PC_{CH_4} is calculated based on the CH_4 concentration of CMM measured by gas analyzers and recorded hourly as CH_4 concentration of CMM measured by gas analyzers/14/. The monthly value is calculated by the hourly recorded data, the value of each month is the weighted average value of daily recorded data. The gas analysers monitors the concentration (in mass) of methane in extracted gas (%). The gas analysers readings are recorded by the operation staff of each CMM power plant hourly/14/ and calculated monthly. Meanwhile, the automatic monitoring DCS system of each CMM power plant collects the data from the gas analysers every hour and delivers them to the project owner. The PP gather all the values/14/ from 4 CMM power plants. CAR 04 is closed.				

Table 4. FAR from this verification

FAR ID	N/A	Section No.	-	Date: -
Description of FAR				
Project participant response				Date: -
Documentation provided by project participant				
VVB assessment				Date:

APPENDIX 5: CALIBRATION DATES AND VALIDITY OF INSTALLED MONITORING EQUIPMENT

Monitoring equipment	Related monitoring parameter as per applicable registered monitoring plan	Serial number	Type	Accuracy or accuracy class	Previous calibration (last calibration before start of this monitoring period)	Calibration date(s) during this monitoring period	Validity of calibration(s)	Delay in calibration: yes/no	Period of delayed calibration
M1	GEN_y $CONSELEC,PJ$	060666417561	DSSD132	0.5s	31-Aug-2019	30-Aug-2020	30-Aug-2020 29-Aug-2021	☒ No ☐ Yes	From: To:
M2	GEN_y $CONSELEC,PJ$	060666417551	DSSD132	0.5s	31-Aug-2019	30-Aug-2020	30-Aug-2020 29-Aug-2021	☒ No ☐ Yes	From: To:
M3	GEN_y $CONSELEC,PJ$	593112054114 77	DSSD188S	0.5s	31-Aug-2019	30-Aug-2020	30-Aug-2020 29-Aug-2021	☒ No ☐ Yes	From: To:
M4	GEN_y $CONSELEC,PJ$	15199795	DSSD132	0.5s	31-Aug-2019	30-Aug-2020	30-Aug-2020 29-Aug-2021	☒ No ☐ Yes	From: To:
F1-Flow Meter	MM_{ELEC}	10310	GLY80	1.5%	15-Sep-2019	15-Sep-2020	14-Sep-2020 14-Sep-2021	☒ No ☐ Yes	From: To:
F1-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F1-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:
F1'-Flow Meter	MM_{ELEC}	10312	GLY80	1.5%	15-Sep-2019	15-Sep-2020	14-Sep-2020 14-Sep-2021	☒ No ☐ Yes	From: To:
F1'-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F1'-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:

C1-Gas analyzer	MM _{ELEC} PC _{CH4}	4103	GJG100H (B)	0~1% methane: ±0.07%; 1%~100% methane: ±7%	29-May-2019	29-May-2020	28-May-2020 28-May-2021	☒ No ☐ Yes	From: To:
F2-Flow Meter	MM _{ELEC}	10311	GLY80	1.5%	15-Sep-2019	15-Sep-2020	14-Sep-2020 14-Sep-2021	☒ No ☐ Yes	From: To:
F2-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F2-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:
C2-Gas analyzer	MM _{ELEC} PC _{CH4}	5660	GJG100H (B)	0~1% methane: ±0.07%; 1%~100% methane: ±7%	29-May-2019	29-May-2020	28-May-2020 28-May-2021	☒ No ☐ Yes	From: To:
F3-Flow Meter	MM _{ELEC}	10301	GLY80	1.5%	03-Sep-2019	03-Sep-2020	02-Sep-2020 02-Sep-2021	☒ No ☐ Yes	From: To:
F3-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F3-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:
F3'-Flow Meter	MM _{ELEC}	10308	GLY80(A)	1.5%	26-Jun-2019	26-Jun-2020	25-Jun-2020 25-Jun-2021	☒ No ☐ Yes	From: To:
F3'-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F3'-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:
C3-Gas analyzer	MM _{ELEC} PC _{CH4}	4106	GJG100H (B)	0~1% methane: ±0.07%; 1%~100% methane: ±7%	29-May-2019	29-May-2020	28-May-2020 28-May-2021	☒ No ☐ Yes	From: To:

F4-Flow Meter	MM _{ELEC}	10305	GLY80	1.5%	08-Sep-2019	08-Sep-2020	07-Sep-2020 07-Sep-2021	☒ No ☐ Yes	From: To:
F4-Pressure transmitter				1.5%				☒ No ☐ Yes	From: To:
F4-Temperature transmitter				2.5%				☒ No ☐ Yes	From: To:
C4-Gas analyzer	MM _{ELEC} PC _{CH4}	4028	GJG100H (B)	0~1% methane: ±0.07%; 1%~100% methane: ±7%	29-May-2019	29-May-2020	28-May-2020 28-May-2021	☒ No ☐ Yes	From: To: