



REDUCING GAS LEAKAGES WITHIN THE TITAS GAS DISTRIBUTION NETWORK IN BANGLADESH



Document Prepared By KBS Certification Services Pvt. Ltd

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Summary:

- A brief description of the VCS verification and the project

Verification: KBS Certification Services Limited has been contracted by NE Climate A/S, the project proponent, to carry out the verification of voluntary greenhouse gas emission reductions generated by the Project, "Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh". The verification is based on the desk review of the Monitoring report /1.1/, VCS PD /06/, registered CDM PDD /27/, previous CDM verifications and previous VCS Verifications, supporting emission reduction calculation spreadsheet for the monitoring period /2.2/ and other relevant supporting documents made available to the verification team by the project proponent accompanied by on-site interviews. This verification involves the period of 01-January-2022 to 31-December-2022 (including both days).

Project: The project's transmission and distribution of natural gas are located in Greater Dhaka and its adjacent areas in Bangladesh. The project will lead to reductions in methane, a potent greenhouse gas (GHG). The project reduces gas leakages from components in the natural gas transmission and distribution system operated by Titas Gas Transmission and Distribution Company Limited (TGTDC) in Bangladesh. During the present monitoring period, the project has reported a total of 37,630 leaks within the project boundary.

- The purpose and scope of verification

Purpose: The purpose of the verification is to review the monitoring results and verify that the monitoring methodology was implemented according to the monitoring plan and monitoring data, used to confirm the reductions in anthropogenic emissions by sources is sufficient, definitive, and presented in a concise and transparent manner. In particular, the monitoring plan, monitoring report, and the project's compliance with relevant VCS, UNFCCC, and host party criteria are verified to confirm that the project has been implemented in accordance with the previously registered design and conservative assumptions, used to confirm the reductions in anthropogenic emissions by sources is sufficient, definitive, and presented in a concise and transparent manner. In particular, the monitoring plan, monitoring report, and the project's compliance with relevant VCS, UNFCCC, and host party criteria are verified to confirm that the project has been implemented in accordance with the previously registered design and conservative assumptions, as documented.

Scope: The scope of the verification is:

- To verify the project implementation and operation with respect to the VCS PD.
- To verify the implemented monitoring plan with the VCS PD and applied baseline and monitoring methodology.
- To verify that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that the reported emission reductions are complete and accurate to be certified.

- The method and criteria used for verification

(a) Desk review, involving:

(i) Review of the data and information presented to verify their completeness;

(ii) Review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;

(iii) Evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions;

(b) On-site assessment involving:

- (i) Assessment of the implementation and operation of the VCS project as per the VCS PD;
- (ii) Review of information flows for generating, aggregating, and reporting the monitoring parameters;
- (iii) Interview with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the VCS PD;
- (iv) A cross-check between information provided in the monitoring report and data from other sources such as inventories, purchase records or similar data sources;
- (v) A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the VCS PD and the selected methodology;
- (vi) Review of calculations and assumptions made in determining the GHG data and emission reductions;
- (vii) Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

- The number of findings raised during verification

A risk-based approach has been followed to perform this verification. During the course of verification, a total of 04 findings were raised, which include:

02 Corrective Action Request (CAR); 02 Clarification Requests (CLs); All the raised findings have been resolved by the PP.

- Any uncertainties associated with the verification

The VCS PD /06/, MR /1.1/, emissions reduction calculations /2.2/ along with the supporting documents provided are considered to be in line with all the VCS requirements /25/. The verification team has detected no further uncertainties or quality restrictions.

- Summary of the verification conclusion

In KBS's opinion, the emission reductions reported for the project "Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh" in the monitoring report are fairly and correctly stated. KBS is, therefore, able to certify that the emission reductions from the project during the period from 01-January-2022 to 31-December-2022, are 4,135,618 tCO₂ equivalents (based on GWP of 28 for CH₄).

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1 INTRODUCTION

1.1 Objective

KBS Certification Services Limited (KBS) has been contracted by NE Climate A/S, the Project Proponent (PP), to undertake the VCS verification of the project titled “Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh” for the monitoring period 01-January-2022 to 31-December-2022 (including both days). Through the verification activities, it is to be confirmed that:

- The project is implemented as described in the VCS Project Description document /06/;
- The monitoring system is implemented and fully functional to generate emission reductions without any double-counting, and
- The data reported are accurate, complete, consistent, transparent, and free of material error or omission by checking the monitoring records and the emissions reductions calculation.

The verification followed the requirements of the current version of the VCS Standard, Version 4.4/25a/, and the VCS program guide, Version 4.4/25b/ to ensure the quality and consistency of the verification work and the report.

1.2 Scope and Criteria

The verification of this project is based on the Monitoring Report for this monitoring period /1.2/, VCS PD /06/, Emission reduction calculation spreadsheets /2.2/, supporting documents made available to the verifier, and information collected through performing on-site visit interviews. Furthermore, publicly available information was considered as far as available and required.

KBS has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

The verification is carried out on basis of the following requirements, applicable for this project activity:

- VCS Standard, Version 04.4/25a/;
- VCS Program Guide, Version 04.4/25b/;
- CDM Methodology: AM0023, Version 04/26/;
- Other relevant rules, including the host country legislation;

The scope of this verification, by independent checking of objective evidence, is as follows:

- To verify that the project is implemented as described in the registered CDM PDD and the VCS PD.
- To assess the project's compliance with other relevant rules including the host country legislation.
- To confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions without any double counting.

- To establish that the data reported are accurate, complete, consistent, transparent, and free of material error or omission by checking the monitoring records and the emissions reduction calculation.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that the reported emission reductions are complete and accurate to be certified.

The method and criteria used for verification consisted of the following phases:

1. Completeness check and desk review;
2. On-site visit interviews with stakeholders;
3. Resolution of outstanding issues and issuance of final verification report and applicable VCS Verification Deeds of Representation.

KBS conducts all its work under strict rules to safeguard impartiality and ensure the independence of the verification team. The verification team does not provide any consulting or recommendations for the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

1.3 Level of Assurance

☒ Reasonable level of assurance

The verification is based on the VCS PD, MR, proof of title, proof of right, additional documents related to baseline and monitoring methodology, the subsequent background investigation, monitoring plan, follow-up interviews and supporting documents made available to the verification team by project proponent. The information in these documents is reviewed against the requirements of VCS Standard Version 4.4. KBS has employed a risk-based approach in the verification, focusing on the identification of significant risks for project implementation and the generation of Emission Reductions.

The items covered in the verification are described below:

- Criteria of VCS Version 4 (VCS Program Guide Version 4.4 & VCS Standard Version 4.4);
- Criteria of CDM approved methodology, AM0023- Version 04.0;
- VCS Monitoring Report
- Monitoring Plan
- Background investigation and follow up interviews
- Stakeholder feedback
- Registered VCS-PD and Validation Report
- Project's compliance with other relevant rules, including the project country (Bangladesh) legislation and assurance to stakeholders of the quality

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data available on public domain. A desk review is carried out to assess the following:

- Compliance with relevant law and regulations
- Stakeholder comments (If any)
- Map – Transmission and distribution pipeline of TITAS
- Baseline study from 29-January-2017 to 28-January-2018.
- Operational Logs/Leak Report files - Detailed log sheets of all leaks with leak code, ` photographs
- Onsite assessment for verification
- Technical Specifications and manuals for the Hi-Flow samplers and GMI Gas Surveyor
- Calibration Certificates for all the Hi-Flow Samplers and FS used during the monitoring phase
- Letter from TGTDCCL confirming system outages in gas supply during the monitoring period,

The Verification team has checked all the above-mentioned details and confirms that all the information provided is accurate.

Through the onsite interview, host country rules and regulations related to project activity, Project description, Technological measures, Implementation, Operation, Management of project activity and Training of personnel, Baseline and Monitoring plan, Stakeholder consultation etc. have been checked and found appropriate.

KBS applies the risk-based approach aimed at focusing on high-risk issues to the verification results whilst not omitting any part of the mandatory processes. A few discrepancies were found during the verification and the findings were submitted to the project proponent, indicated under the titles corrective action requests (CARs) and clarification requests (CLs). CARs and CLs require the PP to take relevant actions.

Hence the above steps were followed for achieving the level of assurance in verification report. Based on the process and procedures conducted, KBS confirms that the information in the MR:

- is materially correct and is a fair representation of the actual project details, and
- is prepared in accordance with VCS requirements /25/ and the applied CDM methodology /26/ for information pertaining to GHG qualification, monitoring and reporting.

The verification work is carried out as per this requirement and the verification opinion is assured, provided the credibility of all above. Details are presented in the Verification statement in section 5 below.

1.4 Summary Description of the Project

This is the 5th monitoring report (overall) and 2nd monitoring report under VCS for the project which employs the CDM methodology; AM0023, Version 04 /26/. *(The project has undergone 3 verifications under CDM, previously)*. The project aims to reduce gas leakages (fugitive emissions) from components in the natural gas transmission and distribution system operated by TITAS in Bangladesh. The gas risers covered under the project boundary are from Greater Dhaka and its adjacent areas and include the following twelve regions: Dhaka, Narayanganj, Narsingdi, Munshiganj, Manikganj, Gazipur, Tangail,

Mymensingh, Jamalpur, Sherpur, Netrokona, and Kishoreganj. The project reduces the leaks in the transmission/distribution system caused by normal component wear, thermal and vibrational stresses, and seasonal expansion/contraction cycling from ambient air temperature changes. The project implements advanced leak detection and repairs (LDAR) procedures to identify and implement various interventions to arrest leakage and thus reduce methane emissions at valves, insulating joints, pressure regulators, and other above-ground gas transmission/distribution infrastructure. The project proponent for the project activity is NE Climate A/S, which owns the rights to VERs /04/.

The total GHG emission reduction achieved from the Project is 4,135,618 tCO₂e for this monitoring period.

The project activity has been implemented as described in the VCS PD and the emission reductions are calculated conservatively as per the applied methodology /26/.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification process was carried out in line with the requirements of VCS standard, Version 4.4 /25a/. In addition, the verification team followed the guidelines of the VCS Validation and Verification Manual, Version 3.2 /25c/. Standard auditing techniques and KBS's CDM Procedures were also applied during the verification. A risk-based approach was followed to carry out verification and access all the factors and concerns that relate to the issuance of emission reductions from a project activity.

They include:

- Identification of all the sources contributing to the project emissions and emission reductions.
- Authenticity of the provided data is checked.
- A risk-based analysis is carried out to ensure a clear and transparent assessment. The risks involved in this process are mainly with the informational flows and data recording.

KBS follows a risk-based verification approach, wherein a desk review of the project documentation is undertaken, which is followed by an onsite inspection by the members of verification team. The verification protocol is filled by the verification team that is based on standard auditing practices and VCS requirements. The verification protocol provides transparent means to record the observations by the verification team members and the non-conformities, if any. The verification protocol is an internal document, and available on request.

Kick off meeting	12-May-2023
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Desk review	12-June-2023
Onsite audit	17-July-2023 to 20-July-2023
Draft Verification Report	16-August-2023
Final Verification Report	20-August-2023

2.2 Document Review

During the document review, the verification team has applied standard auditing techniques to assess the quality of the information provided. The verification was performed primarily based on the review of the monitoring report and the supporting documentation. This process included:

- A review of data and information presented by the PP to verify their completeness
- A review of the MP and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, the QA/QC procedures, and
- An evaluation of data management and the QA/QC system in the context of their influence on the generation and reporting of ERs.

The monitoring report (version 1)/1.1/ was initially reviewed and the verification team requested the PP to present the supporting information and documents /03/ to /28/. The documents were reviewed by the verification team. Through the process of the verification, the revised monitoring report and the supporting documents were evaluated to confirm the actions taken by the PP to the CARs and CLs issued by the verification team.

The list of documents referred during the course of this verification has been provided in Appendix-1.

2.3 Interviews

Please refer section 2.4, where complete list of interviewed personnel and key points discussed is provided.

2.4 Site Inspections

The VVB has conducted the on-site visit along with Local Expert, which was supported with remote assessment from technical expert between 17-July-2023 to 20-July-2023 by following all the Covid-19 Travel guidelines notified by Verra & in accordance with local site requirements. As per the news published by Verra on “Verra to Resume Project Site Visits” dated 12-August-2022: <https://verra.org/verra-to-resume-project-site-visits>, the VVB has notified the Verra in advance regarding its conduct of site visit by filling the “Notice of Validation/Verification Services (NOVS) form”

Details of interviewees, topics covered and additional information are presented below:

Dates:	17-July-2023 to 20-July-2023 (Onsite Assessment)		
Key points discussed:	Name of person interviewed	Designation, Organization	Team Member
- VCS requirements, - Project implementation and operation, - Data collection, storage and archiving procedures followed within organization & at project site, - Leak maintenance under safety and emergency situations, - Sample repair points and their geo coordinates and procedure to avoid double counting, - Monitoring of instrument equipment maintenance and calibration - Training records Training of monitoring personnel (PSL staff) - Calculation of ERs	Engr Md. Mominul Islam	Deputy Manager TGTDCCL	Mr. Srinivasan Selvaraj (Team Leader)
	Md. Masud Ahammed	Manager CDM TGTDCCL	
	Md. Mahbub Sarwar	Project Manager CDM PSL	Ms. Varsha Bohiya (Verifier)
	Engr. Tanvir Ahmed	Deputy Project Manager PSL	Mr. Manoj K. M. Chaturvedi
	Engr. Tuhin Shuvra Ghosh	Database Manager PSL	(Technical Area Expert 10.1)
	Engr. Shah Ashequr Rahman	Project Manager PSL	Mr. Sayed Anwar (Local Expert)

KBS has conducted an on-site inspection to confirm all physical features of the project activity described in the registered PD are in place and that the project proponent has operated and correctly monitored all parameters of the project activity as per the registered CDM PDD and VCS PD during this monitoring period. A reasonable level of assurance has been maintained for verification as follows:

- 1) An assessment of the implementation and operation of the project activity as per the VCS PD
- 2) A review of information aggregating and reporting of the monitoring parameters
- 3) Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the MP
- 4) A cross-check between product sales information provided in the MR and data from other sources.
- 5) A check of the monitoring equipment including calibration performance, and observations of monitoring practices against the requirements of the VCS PD and the applied monitoring methodologies
- 6) A review of calculations and assumptions made in determining the GHG data and ERs, and
- 7) An identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters

The total number of leaks identified, repaired, and then re-surveyed within the monitoring period was cross-checked by the verification team with the ER calculation spreadsheets /2.2/ and can be confirmed to be correct.

The verification team took note of paragraphs 26 and 27 of the Sampling Standard, version 09 which states the following:

Paragraph 26: The DOE may apply a sampling approach for on-site visits and/or remote surveys as part of validation/verification, applying the “Guideline: Sampling and surveys for CDM project activities and program of activities”, irrespective of whether the above-mentioned sampling plan exists or the project participants or the coordinating/managing entity have undertaken sampling surveys.

Paragraph 27: When the project participants or the coordinating/managing entity have not applied a sampling approach, the DOE may apply a sampling approach, choosing a different confidence/precision than the ones indicated in paragraph 11 above, provided that samples are randomly selected and are representative of the population.

As it is not possible to individually verify all the reported leaks, the verification team applied a sampling approach for the on-site assessment/inspection. The verification team has then randomly selected 75 sample points for the on-site inspection. The detailed method/steps applied to randomly select the sample points out of the total leaks are provided below:

The verification team used an online calculator to derive an appropriate initial number of samples for an on-site visit. The verification team has applied a 90/10 confidence/precision (assuming response distribution as 90%) and the sample size calculated is minimum 68. The verification team decided to take higher number of samples, 75 and the same is conveyed to the PP in the verification audit plan. The verification team had also indicated in the verification audit plan, that during the on-site visit inspection if the discrepancy is identified in the selected samples, the verification team shall increase its sample size (applying the materiality concept in line with VVS for project activities, version 03.0).

The basis for the selection served geographical multi-stage sampling, as based on Standard for sampling and surveys for CDM project activities and programme of activities /28a/. The methodology for the leaks selection was as follows:

1. For 9 Divisions (which were classified as primary units) in the project the total number of 75 leaks was conservatively defined (min. 68 as per formula for number of samples) for the assessment purposes.
2. Taking into account spatial extension of the project over a big territory, leaks for the assessment were selected from each Division database taking into account their spatial distribution. At this stage, several Sub-areas (secondary geographic units) were selected randomly for each region for assessment purposes:
 - ☐ For the MD-4 Division, Sub-area with code 1 and 7 were randomly selected
 - ☐ For the MD-5 Division, Sub-area with code 1 and 7 were randomly selected
 - ☐ For the NA-J Division, Sub-area with code 50 and 51 were randomly selected

From the above mentioned sub-areas, leaks to be assessed were manually and randomly selected and highlighted by the verification team. At this stage attention was also paid not to highlight all the leaks at one address in order to reach higher spatial distribution of the leaks for assessment purposes.

Selected and highlighted leak points in the regional project excel spreadsheets were copied to a separate excel spreadsheet, summarized and sent to the project developer in order to request the project documentation on each selected leak for the assessment purposes.

Following the nomenclature given in the CER Calculation Spreadsheets /2.2/, the verification team have conservatively randomly appointed 75 chosen sample points for field inspection and desk review analysis as follows:

MD-04				
MD-4.28.RR.5472.2	MD-4.2.RR.332.1;	MD-4.2.RR.324.1;	MD-4.2.RR.1135.1;	MD-4.30.RR.5171.1
MD-4.28.RR.5642.1	MD-4.2.RR.602.1;	MD-4.2.RR.382.1;	MD-4.2.RR.339.1	MD-4.30.RR.1123.1
MD-4.28.RR.5646.1	MD-4.29.RR.1368.2;	MD-4.29.RR.2179.2	MD-4.2.RR.1309.1	MD-4.30.RR.5173.1
MD-4.31.RR.84.1	MD-4.2.RR.4048.1;	MD-4.28.RR.4897.1	MD-4.28.RR.4901.2	MD-4.30.RR.5192.1
MD-4.31.RR.116.1	MD-4.28.RR.4910.1	MD-4.28.RR.4920.1	MD-4.28.RR.5419.1	MD-4.30.RR.5191.1

MD-05				
MD-5.22.RR.2019.1	MD-5.22.RR.2012.2	MD-5.22.RR.2002.1	MD-5.22.RR.1956.1	MD-5.22.RR.1951.1
MD-5.22.RR.2103.1	MD-5.22.RR.2109.1	MD-5.24.CR.1.1	MD-5.24.RR.17.1	MD-5.24.RR.3052.1
MD-5.24.RR.3055.1	MD-5.24.RR.3012.1	MD-5.24.RR.3013.1	MD-5.22.RR.1190.1	MD-5.22.RR.1537.1
MD-5.22.RR.1378.1	MD-5.22.RR.1380.1	MD-5.22.RR.1479.1	MD-5.22.RR.1401.1	MD-5.22.RR.1406.1
MD-5.22.RR.853.1	MD-5.22.RR.654.1	MD-5.22.RR.351.1	MD-5.23.RR.325.1	MD-5.24.RR.127.1

Narayanganj				
NA-J.51.RR.7733.1	NA-J.52.RR.4.1	NA-J.52.RR.13.1	NA-J.52.RR.46.1	NA-J.52.RR.50.2
NA-J.52.RR.67.2	NA-J.51.RR.7734.1	NA-J.50.RR.9876.1	NA-J.50.RR.9880.1	NA-J.50.RR.9860.1
NA-J.52.RR.2152.1	NA-J.50.RR.9605.1	NA-J.51.RR.7708.1	NA-J.50.RR.9609.1	NA-J.52.RR.2149.1
NA-J.52.RR.2152.1	NA-J.52.RR.2157.1	NA-J.51.RR.7665.2	NA-J.51.RR.7709.1	NA-J.51.RR.7669.1
NA-J.51.RR.29.1	NA-J.51.RR.30.1	NA-J.52.RR.1733.1	NA-J.52.RR.1736.2	NA-J.52.RR.2283.1

During the assessment of selected sample points, as applicable, the verification team has conducted an on-site inspection and also a plausibility check of information provided in:

1. Leak tags fixed on-site at every surveyed leak /14/,
2. Operational Logs /15/,
3. ER calculation spreadsheets /2.2/ and
4. HFS memory/Data Log Files /16/.

All information of the selected sample points verified was consistent and plausible and thus no further samples were conducted by the verification team and the records of all the repaired leaks were acceptable to the verification team. The verification team carried out on-site interviews with representatives of PP to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

2.5 Resolution of Findings

KBS, during this verification, identified issues related to the monitoring, implementation, or operation of the VCS project that could impair the capacity of the VCS project to achieve project emission reductions or influence the reporting of emission reductions. KBS has identified and discussed these issues within the Verification report in Appendix 4.

- Clarification requests (CLs): Project reporting lacks transparency and further information is needed to determine if a material discrepancy is present.
- Corrective action requests (CARs): The VVB has identified a material discrepancy or non-conformance that the project proponent must address.

The verification team identified 02 CARs and 02 CLs. All CAR and CLs raised by KBS during this verification have been resolved by the PP.

2.5.1 Forward Action Requests

Forward Action Request (FAR) is to be raised when the monitoring and reporting require attention and/or adjustment for the next verification period. FARs do not relate to VCS requirements for issuance of ERs achieved during subject monitoring.

No FAR was raised either during CDM validation or previous verifications. KBS has not raised any FAR during this verification.

2.6 Eligibility for Validation Activities

The project activity falls under sectorial scope 10 and the KBS is accredited for validation /verification of project activities under this scope.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

As confirmed through the onsite interview and the review of various registries, the project is registered in CDM and project ID reference is 10077. The project was registered by UNFCCC on 17/03/2015. However, the PP has not proceeded to claim CERs and has switched to VCS, since the start of the crediting period. PP has also provided an undertaking /24/ to confirm that there is no double accounting for current monitoring period.

The verification team also checked the CDM UNFCCC project webpage, to confirm if the PP has hosted a monitoring report for any duration under the crediting period. The verification team noted that the PP has not submitted any Emission reduction claims in CDM.

3.2 Methodology Deviations

There is no methodology deviation identified during the current monitoring period.

3.3 Project Description Deviations

There is no project description deviation identified during the current monitoring period.

3.4 Grouped Project

This is not a group project hence this section is not applicable.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The VCS project, “Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh” (VCS Project ID 2930) applies the CDM methodology AM0023 version 04 /26/. This is the second monitoring report for the project under VCS.

KBS by means of on-site visit interviews and document review assessed that all the features (technology, project equipment, and monitoring) of the registered PDD are in place and that the project participants have operated the project as per the registered PDD /06/.

The project aims to reduce gas leakages from components in the natural gas transmission and distribution system operated by TGTDC in Bangladesh. The gas risers covered under the project boundary are from Greater Dhaka and its adjacent areas and include the following twelve regions: Dhaka, Narayanganj, Narsingdi, Munshiganj, Manikganj, Gazipur, Tangail, Mymensingh, Jamalpur, Sherpur, Netrokona, and Kishoreganj. The project reduces the leaks in the transmission/distribution system caused by normal component wear, thermal and vibrational stresses, and seasonal expansion/contraction cycling from ambient air temperature changes. The project implements advanced leak detection and repairs (LDAR) procedures to identify and implement various interventions to arrest leakage and thus reduce methane emissions at valves, insulating joints, pressure regulators, and other above-ground gas transmission/distribution infrastructure.

The verification team noted that a similar project covering other distinct subareas of the TGTDCCL service area is being proposed under VCS (Project ID: 3021). None of the sub-districts, regions, or infrastructure in this project overlap with each other. The emission reductions implemented through this project will be demonstrably unique in their location through GPS coordinates and other identification data like street addresses and visual markings and not be included in any other project claiming emission reduction credits under other GHG programs so there is no double counting.

As stated in the MR, the project is funded by NE Climate, which provides survey equipment, repair materials, and project transportation. The PP (NE Climate) has hired Climate Compass LLC as a technical partner to help manage the project implementation and compliance with the registered CDM PDD. Climate Compass has hired M.B.S as a 3rd party technical consultant to help confirm through regular inspections that the project is compliant with the methodology and PDD. Climate Compass has hired Prokaushali Sangsad Limited (PSL) to do the project implementation work on a day-to-day basis.

The PSL team includes project managers to direct the daily workflow, database managers to ensure the data gathered from the project is recorded correctly, and operators in the field who take the appropriate measurements and log the data. The roles and responsibilities of each of the above parties are discussed and the respective documentation has been verified by the verification team. The training certificates of the monitoring personnel and calibration team are checked and verified by the verification team /23/ which could also be confirmed by the verification team during the on-site visit interviews.

37,630 gas leaks are included in the database of the current monitoring period and were monitored. As per the registered PDD: The project boundary will be defined in detail in a database, of all the leaking components identified and repaired during the baseline study completed on the above-ground equipment in the TGTDCCL gas system. The PP had done the baseline survey from 29-January-2017 to 28-January-2018 and the components covered during the baseline survey form the project boundary. This is in line with the registered PDD and also the applied methodology. The verification team also noted that in some components, second or third leaks were identified during the monitoring and PP is claiming emission reductions only for the period after the monitoring date when the new leaks were repaired or after the date of re-repair for any re-emerged leaks till the end of the monitoring period. This is deemed acceptable to the verification team as these newly found leaks are within the project boundary.

The assessment of gas leak repairs made with advanced material was done by visual inspection of the quality of the repair of all leaks assessed during on-site visit inspection and interviews by the verification team. The check of the quality of the repairs was made through the leak flow identification made by the verification team by on-site inspection with the application of GS/HFS device and soap spray solution, monitoring records check for selected leaks via cross-checking of references as well as desk review and check of Emission Reduction calculation spreadsheet /2.2/.

The project activity is processed using multiple steps for every individual leak surveyed, starting with the leak identification by an LDMT, the subsequent repair of these detected leaks by repair teams, and, finally, the LDMT undertakes additional measurements to monitor the effectiveness of the repairs undertaken. If required, re-repair steps are included in this process chain. The major measurement devices applied are a set of up to three identical Hi-Flow Samplers obtained from the US-based distributor Heath Consulting, where the proper operation and maintenance of these Hi-Flow Sampler devices, including staff training, is supervised and controlled by MBS. The HFS, a product of Bacharach Inc., is a machine designed to detect and measure leaks in gas infrastructure.

The Hi-Flow Sampler, a high volume sampler, represents a technology directly referenced in the applied monitoring methodology AM0023, version 04 /26/ and the registered CDM PDD /27/ for use in quantifying emissions. The device operates by capturing all emissions from a leaking component to accurately quantify leak flow rates. Leak emissions, plus a large volume sample of the air around the leaking component, are pulled into the instrument through a vacuum sampling hose.

Methane emissions are obtained by calibrating the hydrocarbon detectors to a range of concentrations of methane in the air. Hi-Flow Samplers are equipped with special attachments designed to ensure complete emissions capture and to prevent interference from other nearby emissions sources. The hydrocarbon sensors are used to measure the exit concentration in the air stream of the system. The Hi-Flow Sampler automatically accounts for standard temperature and pressure (i.e., 0 degrees Celsius and 101.3 kPa) in its leak flow rate measurements. The normalized results of the measured leaks are $\pm 10\%$ accurate.

The data management team coordinates the process of detecting, repairing, and monitoring leaks involving thorough management of data through different media (weather-proof data tags, hard copy protocols, leak report files, data log files, and ER calculation spreadsheet). In this respect for every individual leak, the ER calculation basically starts with the first monitoring after this individual leak repair has been successfully undertaken (or with the start date of the monitoring period, whichever is later), and ends with the end date of the monitoring period. For this monitoring period (from 01-January-2022 to 31-December-2022) a total number of 37,630 leaks have been included in the data system of the project activity.

During the desk review process and on-site visit, it could be confirmed that the implementation and the operation of the project activity are consistent with the approved baseline and monitoring methodology AM0023, version 04 /26/ and the registered CDM PDD /27/. Also, the project operated continuously during the monitoring period with a steady supply of natural gas except during the outages, as confirmed by TGTDC /21/. Titus tracks the continued operation of all the various gas lines across its system. In the case where a particular section of the distribution system is not operational (for example during a large scale repair / disconnection), the hours during which the system is not operational are tracked. The total hours of operation of all the leaks affected by a given outage are adjusted to reflect the reduced hours of operation.

Technical specifications of the Gas Surveyor and High Flow sampler were checked with the websites <https://www.manualslib.com/manual/537303/Bacharach-Hi-Flow-Sampler.html> and <https://www.manualslib.com/manual/1635234/Gmi-Gasurveyor-11-500.html>. The age and average lifetime of the material used in the repair was checked with the letter from MBS Ltd, which confirms that the repair materials used in the project are designed to and capable of ensuring that the leaks mostly do not reappear within the 10 years of the project crediting period.

A complete set of monitoring data as specified in the registered CDM PDD have been provided to the verification team relevant for the monitoring period from 01-January-2022 to 31-December-2022 (including both days) and all necessary evidence, data files, and underlying documents have been transparently provided to the verification team, such as ER calculation spreadsheet /2.2/, Leak Report Files, Hard Copy Protocols and Data Log Files of the Hi-Flow Sampler /15/ /16/.

Furthermore, the verification team noted that there were a few risers for which the gas supply was stopped for some period during the monitoring period or during the monitoring, and PP was not able to reach a few of them. In all such cases of outages, PP has not considered these risers for emission reductions for the full monitoring period which is a conservative approach and hence deemed acceptable to the verification team.

The verification team has cross-checked whether the leak tags correspond to the photos of leak tags made and provided in the excel sheets – Operational Logs for leaks /15/, and also whether the hand-written information entered by the operator provided in the leak tags such as:

- leak ID number on leak tags
- Date of baseline leak flow measurement (before the repair), the date of leak flow measurement after leak repair (or also re-repair, if any), and the date of leak flow monitoring measurement(s)
- The values of leak flow on the date of baseline leak measurement, on the date of leak flow measurement after leak repair (or also re-repair, if any), and on the date of monitoring measurement(s)
- The HFS number applied on the date of baseline leak flow measurement, the date of measurement after leak repair (or also re-repair, if any) and the date of leak monitoring measurement(s), and the records numbers in HFS memory corresponding to each leak flow measurements
- The name of the operator who has performed each corresponding leak flow measurement corresponds to the information contained in (i) hard copy protocols (ii) leak report files, (iii) ER calculation spreadsheet, and (iv) Data Log Files, as appropriate, for each on-site visit surveyed leak.

The total amount of GHG reductions calculated for this monitoring period from 01-January-2022 to 31-December-2022 including both days is 4,135,618 tCO₂e.

The verification team confirms that an appropriate approach has been chosen by the PP to ensure that within the monitoring period, the claim for emission reductions for any new leaks that have been identified during monitoring is restricted to the period after the monitoring date when the new leaks were repaired or after the date of re-repair for any re-emerged leaks till the end of the monitoring period (i.e. 31-December-2022). The verification team noted that for the current monitoring period, 432 new leaks were identified. This was confirmed by verifying the Summary report from MBS for the project monitoring period/11/.

Following the decision tree of leaks inclusion in the project activity (page 27 of the CDM PDD) when equipment ceases to function and leaks in emergency situations, these leaks will be repaired by an emergency repair team that works completely independent from the operation of the project activity. The corresponding procedures are described in the MR /2/. No emergency leaks and cases with replacement of equipment were included in the emission reduction calculation spreadsheet which could be confirmed through interviews with the representatives of TGTDCI and PSL and also a declaration provided by TGTDCI and a sample log of emergency repairs maintained by TGTDCI /11/. During each monitoring visit, the operator checks the current configuration of the equipment against the photographs and technical schematics completed during the baseline study. Database entries representing leaks that have been shut off are no longer used to calculate emission reductions. Thus, it can be confirmed that emission reductions resulting from the leaks repaired before the list of scheduled equipment to be replaced in the baseline scenario are not claimed in the ER calculation spreadsheet.

Following the decision tree of leaks inclusion in the project activity, the leak which can be identified and repaired with materials and know-how available before the CDM Project (like a simple tightening of a loose-fitting or connection) has not been included in the CDM Project Database, which could be confirmed by the interviews made with the members of LDMT and representative of MBS and PSL. Based on the visual observation of the sample leaks during the on-site visit assessment of the project performed, the verification team has confirmed the usage of only advanced repair materials for all leaks repaired as part of the project activity.

The project activity complies with all the national statutory requirements /21/. The verification team considers the project description to be complete and accurate.

KBS's verification team confirms that the project activity is implemented within the boundary of the project activity as described in the registered PDD /27/ and the implementation and operation of the project activity have been conducted in accordance with the description contained in the registered PDD/VCS PD.

During the on-site interviews verification, QA/QC procedures were identified which demonstrate that: the operational and management system of the project is in place; data were centralized; monitoring data were crosschecked, records stored and confirmation that all operational staff was trained before taking up positions. The verification team thus confirmed that the monitoring of the project activity

has been implemented in accordance with the monitoring plan in the VCS PD.

The VCS PD clearly describes the monitoring and responsibility of monitoring done by PP. During the on-site interviews, monitoring, data collection, and reporting procedures were confirmed with the relevant staff and through document review of samples of all relevant records.

All the ex-ante parameters which are used in the calculation of emission reductions are consistent with the CDM PDD / VCS PD. It is confirmed that ex-ante parameters mentioned in section 4.1 of the MR /1.2/ are in line with the parameters mentioned in section 5.1 of the VCS PD. All the ex-post parameters have been monitored as per the monitoring plan and presented in section 4.2 of the MR /1.2/.

In summary, the monitoring period is reasonable, and the operation of the project activity is in accordance with the registered PD /06/. There were no changes observed from the technology stated during the validation. KBS's verification team considers the project description to be complete and accurate.

Ownership and other programs:

The verification team noted that the project activity is registered under CDM with project ID 10077, on 17-March-2015 (i.e., before validation for VCS is completed on 12-Dec-2022). The PP proceeded with VCS registration for claiming VCUs because of low demand for CERs. The PP did not proceed to claim Certified Emission Reductions (CERs) after completing three monitoring periods as per CDM crediting period and instead claimed Verified Carbon Units (VCU) in VCS for the fourth monitoring period and current monitoring period. PP confirmed that the project will only be going forward with VCS registry, as declared separately in a declaration /24/. Thus, emission reductions generated by project will be solely claimed by PP and PP has the right of use, which is acceptable.

PP will not claim any other environmental/carbon credits under any other GHG emission reduction scheme for the crediting period under VCS and PP has provided declaration /24/ on the same during the verification. Hence, there is no possibility of double counting.

Sustainable Development Contributions

Natural gas leaks result in emissions of methane into the atmosphere. The implementation of the project from 29-January-2017 has already started emission reductions. In addition to reducing greenhouse gas emissions, this project will also contribute to the People's Republic of Bangladesh's sustainable development goals by:

Improving environmental quality and minimizing risks for employees and local communities due to the reduction of harmful pollutant (methane);

Preserving a finite resource (natural gas). The reduction in gas losses will mean that the same amount of service can be provided to customers of TGTDCCL but with a lesser amount of gas required. Using a finite resource more efficiently, and thus preventing waste of that resource, is an important example of sustainable development;

Capacity building of the local staff in advanced LDAR techniques;
Transferring advanced technology in the form of leak detection kits and repair materials that have not been utilized in Bangladesh prior to this project;
Job creation through the hire of around 23 staff;
Strengthening human capital in the country through retention and employment of locals to support the project implementation (leak measurement program, repair works, and monitoring).

Management and operational system:

Verification team was able to verify that authorities and responsibilities for monitoring and reporting of all data related to the emission reductions were clearly defined for the monitoring period from 01-Januaray-2022 to 31-December-2022 (Inclusive of both days).

The allocation of the responsibilities is documented in a written form and is followed as described in the registered VCS PD/06/. Routines for the archiving of data are defined and documented.

The monitoring plan described in section 4.3 of the MR/1.2/ is confirmed to be correct. All the parameters of the monitoring plan are monitored using appropriate monitoring arrangements.

The verification team noted that the project takes place on the gas distribution system of TITAS. One of the Assistant Project Managers in the project is a TITAS employee, who ensures access to the distribution line for the project. The PP, NE Climate, provides the monitoring equipment, repair materials and project transportation for the project. M/s. Climate Compass acts as a technical partner in the project and manages the overall project implementation and compliance with the approved methodology. M.B.S acts as a third party technical consultant and carries out regular inspections to confirm that the project is compliant with the methodology. The Dhaka based company, Prokaushali Sangsad Limited (PSL) provides support for the project implementation work on a day-to-day basis. The PSL team includes project managers (who direct the daily workflow), database managers (who ensure that the data gathered from the project is recorded correctly), operators in the field (who take the appropriate measurements and log the data) and repairmen. The verification team verified the roles and responsibilities of different stakeholders in the project and noted that they are implemented and maintained as per the descriptions provided in the registered VCS PD /06/ and in MR /1.2/.

During the on-site assessment and through interview with the PSL team, the verification team noted that LDMT is tasked with gathering data for entry into the Project Database from their own field observations and input from the Repair Team. The LDMT are responsible for leak detection and measurement, subsequent measurement of repairs, and ongoing monitoring of repairs using sophisticated leak detection and measurement equipment – the Gas Surveyor and the Hi-Flow Sampler (HFS). The verification team noted that the Operators from the LDMT take written field notes, draw schematics and take pictures, which they then transcribe into excel format. The excel forms are delivered to the Database Managers, who review the data for errors before entering it into the Project Database.

As discussed above, the verification team concludes that management and operational system of the project is implemented and operated well. Thus, it ensures the quality of data which is required in calculating the emission reductions. The Project is reduction of leaks in the gas distribution network and does not involve in production, delivery, and sale of product or service to the consumer.

Implementation status of the monitoring plan:

Verification team confirms through onsite inspection and from the document review, Operational logs/15/, Leak tags /14/ and HFS memory data /16/ that the actual monitoring system complies with the monitoring plan mentioned in the registered VCS PD /06/ and there is no deviation in monitoring plan and procedures.

During the verification, all relevant monitoring parameters of the registered monitoring plan have been verified with regard to the appropriateness of the verification method; the correctness of the values applied for ER calculation, the accuracy and applied QA/QC measures. All monitoring parameters have been measured / determined without material misstatements and are in line with all applicable standards and relevant requirements. It is confirmed that the monitoring mechanism is effective and reliable.

Therefore, from the document review and onsite inspection, it is confirmed that all the parameters were monitored in accordance with the registered monitoring plan during the monitoring period. Following are the details of monitoring in accordance with the monitoring plan of the registered VCS PD/06/:

The details of monitoring parameters used for calculation of emission reductions are provided below:

1. **Data/Parameter, Unit:** $T_{j,y}$ – The time the relevant component, in which physical leak j , occurred, would leak in the baseline scenario and would be eligible for crediting during the crediting year y (hours).

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment
Purpose of data	Calculation of Baseline emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The verification team noted that the dates of leak measurements (monitoring date) are recorded directly by the operators on Operational Logs /15/ and on Leak tags /14/. The details are also captured electronically in the memory of Hi-Flow Samplers and cameras. Based on these monitoring dates, the verification team noted that operating hours for each leak point have been determined as Sum of 'Number of Operational Hours for period before monitoring date during the monitoring period (hours)' and 'Number of Operational Hours for period after monitoring date or after Re-Repair for re-

	emerged leaks or after repair new leaks till the end of the monitoring period (hours)'. The details are presented in 'Column AJ' and 'Column AK' in the tab, 'Total' in the CER calculation spreadsheet.
Measuring/Reading/Recording frequency	The parameter is measured continuously throughout the monitoring period and the final value is calculated at the end of the monitoring period. The measuring and recording frequency are hence in compliance with the PDD and the applied methodology.
Data collection (from data generation, aggregation, to recording, calculation and reporting)	The verification team has assessed the calculation procedures applied in CER calculation spreadsheets /2.2/ for the calculation of hours of operation of leak repairs. The verification team noted that the calculations are done in an accurate and correct manner and the calculations are made in line with the approved monitoring plan in PD /06/ and approved methodology /26/. The implementation of details on roles and responsibilities for the monitoring as provided in the registered PD/06/ was verified. The database manager verifies the consistency and completeness of data monitored. The LDMT members were interviewed, and the assessment team confirms that the details as provided were followed at site and are reliable for the calculation of the leakage emissions. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan.
Verified value	Multiple Values for each leak 'i' (see Emission Reduction calculation sheets for each leak) The verification team noted that if a particular piece of equipment that affected the leak repair was shut off, the hours covered during the shut off period are correctly subtracted from the total. The verification team evidenced the same in the CER calculation spreadsheets /2.2/. Example: For the leak, 'GA-R.38.RR.1000.1', the Gas supply to Unit was stopped on 03-05-2022 at 22:00:00 and the gas supply started on 05-05-2022 at 22:00:00, meaning there is no gas supply for 48 hours. This 48 hour is subtracted from the total operating hours for this leak (Refer Cell 'AH 1706'). The details of all such outages are presented separately for each leak in the Tab, 'Outage'. Also, the verification team noted the PP has assumed that any reappeared leak found in a given monitoring period occurred immediately after the previous monitoring period ended. This approach is found conservative. Example: GA-R.3.RR.439.1.
Cross checks	The verification team noted that any outages resulting from system repairs are documented and logged in the project database in the form of a reduction in the time of operation. Any other unscheduled shutdown, is also found timed and accounted for through a reduction of operating hours. The outage details were cross

	checked with the information provided by TITAS /22/ and found to be consistent. Dates of repair entered in Operational Logs /15/ were visually cross-checked by verification team with information on date of leak repair on leak tags /14/ fixed to each leak for the selected sample of 75 leaks during on-site visit. No material misstatements were found.
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2. Data/Parameter, Unit: T_z , the time, the relevant component has been leaking during the crediting year y following a monitoring measurement (hours)

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment
<i>Purpose of data</i>	<i>Calculation of Project emissions</i>
<i>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</i>	Hours of operation during which time the leak is venting gas are calculated between the leak flow measurements dates and repair dates, in excel CER calculation spreadsheets /2.2/. The dates of the various measurements are recorded directly by the operators on Operational logs /15/ and leak tags /14/ and are captured electronically in the memory of Hi-Flow Samplers and photographs.
<i>Measuring/Reading/Recording frequency</i>	The parameter is measured continuously as verified during the on-site inspection. The measuring and recording frequency are hence in compliance with the PDD and the applied methodology.
<i>Data collection (from data generation, aggregation, to recording, calculation and reporting)</i>	The verification team noted that any outages resulting from system repairs are documented and logged in the project database in the form of a reduction in the time of operation. Also, the verification team noted that even if an unrelated activity requires the shut-down of an already repaired piece of component, the hours of operation for every piece of affected component are reduced in the database for the entire duration of the shut-down. The verification team also noted that any other unscheduled shutdown is also timed and accounted for through a reduction of operating hours. These were confirmed through interview with the Leak detection and repair team. The verification team has performed the verification of calculation procedures applied in CER calculation spreadsheets /2.2/ for the calculation of hours of operation, during which time the leak is venting gas (T_z parameter). The verification team noted that the calculations are done in an accurate and correct manner and the calculations are made in line with the approved monitoring plan in PD /06/ and approved methodology /26/. The implementation of details on roles and responsibilities for the monitoring as provided in the registered PD/06/ was verified. The database manager verifies the consistency and completeness of data monitored. The LDMT members were interviewed, and the

	assessment team confirms that the details as provided were followed at site and are reliable for the calculation of the leakage emissions. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan. .
Verified value	Multiple Values for each leak 'i' (see Emission Reduction calculation sheets for each leak)/2.2/. For this monitoring period, the verification team noted that this value for this parameter is '0' for all the cases. The hours of operation, during which time each leak is venting gas was verified in CER calculation spreadsheets /2.2/. It is calculated as hours between each corresponding date of leak flow measurement and the date of leak repair. It can be confirmed that the calculation was done in correct manner in line with procedures defined in PD /06/. Example: For the 'GA-R.3.RR.439.1', the leak was detected during the monitoring on 11-August-2022 (Cell K 95) in the tab 'Total'. The leak repair date is 11-August-2022 (Cell Q 95) During on-site visit of the sampled leak points, through interview with the project manager Mr. Tanvir and Repair team, verification team noted that all the leak repairs were made with modern material, as specified in PD /06/.
Cross checks	The verification team noted that the project team immediately repairs any reappeared leaks they find. Hence, there is no time period for leakage to measure for project emission. This is confirmed through interview with Leak detection and repair team during the on-site inspection. Existing data management ensure correct transfer of data and reporting of emission reductions, necessary QA/QC processes are in place.

3. Data/Parameter, Unit: Temperature and pressure of natural gas – Conditions observed at the point and time of the leak rate measurement (°C and bar)

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment
Purpose of data	Calculation of baseline and project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The verification team noted leaks are measured using the Hi-Flow sampler. From reviewing the technical specifications of the equipment /17/, the verification team noted Hi-Flow™ Sampler automatically adjusts readings to standard temperature and pressure (0 °C and 101.3 kPa) and this is reflected in the machine's margin of error. Therefore, there is no need to monitor these parameters separately. They are integrated in the measurement results. (The assessment details on monitoring equipment and their calibration are included in the parameter 'Leak flow rate' in this section).
Measuring/Reading/Recording frequency	As and when a leak is measured using HFS.

	The measuring and recording frequency are hence in compliance with the registered PDD and the applied methodology.
<i>Data collection (from data generation, aggregation, to recording, calculation and reporting)</i>	The implementation of details on roles and responsibilities for the monitoring as provided in the registered PD/06/ was verified. The verification team noted that the LDMT gather data for entry into the Project Database from their own field observations and input from the Repair Team. The LDMT are responsible for leak detection and measurement, subsequent measurement of repairs, and ongoing monitoring of repairs using sophisticated leak detection and measurement equipment – the Gas Surveyor and the Hi-Flow Sampler (HFS). Operators from the LDMT take written field notes, draw schematics and take pictures, which they then transcribe into excel format. The excel forms are delivered to the Database Managers, who review the data for errors before entering it into the Project Database. The LDMT were interviewed, and the assessment team confirms that the details as provided, were followed at site and are reliable. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan.
<i>Verified value</i>	The verification team noted that the values of Temperature and Pressure are included in the HFS reading of leak-rate. (See the Emission Reduction calculation sheets). Temperature and pressure measurements are taken into account by the hi-flow sampler at the time of measurement and are integrated into the results from the hi-Flow sampler device. Hence, there is no separate monitoring of Temperature and pressure.
<i>Cross checks</i>	Values taken from Hi-Flow sampler measurements. In some small number of cases, access to the repaired equipment was blocked (construction sites, street repairs, etc.) preventing the monitoring teams from accessing leak repairs to monitor them. In order to ensure the results are conservative, no Emission Reductions were claimed in this period for those leaks that were not able to be monitored. During field inspection of all 75 randomly chosen sample points mentioned in Section 2.1 the leak tightness of all samples have been checked by the verification team using Gasurveyors where the leak repairs have taken place. This technique is well established for easily identifying leaks and, as described in the registered PDD /27/, has been applied also by the PP's LDMT for leak detection. It was verified all the sample points showed complete leak repair effectiveness. As a result, the verification team concluded that leak flow measurements for the project is performed correctly and deviations were not observed and the quality of leak repairs is good and is in line with provisions of PDD /27/.

4. Data/Parameter, Unit: UR_j, The uncertainty range for the measurement method applied to leak j (Fraction)

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment
Purpose of data	Calculation of baseline and project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Leaks are identified and measured using the Hi-Flow sampler. (The assessment details on monitoring equipment and their calibration are included in the parameter 'Leak flow rate' in this section). The parameter is calculated using a 95% confidence interval as per guidance provided in the applied methodology, which refers to Chapter 6 of the 2000 IPCC Good Practice, to calculate UR using the combined uncertainties of all leak measurements. The URj is calculated using leakage flow rates and the respective Uncertainty Range of the Hi-Flow sampler used for the leak. The uncertainty calculations are included in the ER calculations spreadsheet in a separate Tab, 'Uncertainty'. The high flow sampler is calibrated and double checked every 30 days while in use with the date and signature of the person in-charge of the calibration recorded in a calibration log.
Measuring/Reading/Recording frequency	The verification team noted that the measurements are taken regularly with the Uncertainty calculated from all the leak measurements. The measuring and recording frequency are hence in compliance with the registered PDD and the applied methodology.
Data collection (from data generation, aggregation, to recording, calculation and reporting)	The verification team noted that this parameter is calculated using a 95% confidence interval as per guidance provided in Chapter 6 of the 2000 IPCC Good Practice Guidance The URj is calculated using leakage flow rates and the respective Uncertainty Range of the Hi-Flow sampler used for the leak measurements, which is +/- 10 %, as evidenced from the manufacturer's specifications. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan.
Verified value	0.00075992 The verification team noted that the measurements are taken regularly with the Uncertainty calculated from all the measurements (see Emissions Reductions calculation sheet, Tab 'Uncertainty' for complete calculation)
Cross checks	The verification team noted that the uncertainty of the measurement is taken into account conservatively by using the flow rate at the lower end of the uncertainty range of the measurement at a 95% confidence interval for baseline emissions from leaks. Thus the verification team concludes that the value determined for this parameter assures to a 95% level of confidence as per methodology and that the measurement values used in the calculations are conservative.

5. Data/Parameter, Unit: $F_{CH_4,j} / F_{CH_4,z}$ - (m^3CH_4/h), the leak flow rate of methane for leak (j, z)

from the leaking component.

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment																								
Purpose of data	<i>Calculation of baseline and project emissions</i>																								
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The verification team noted that the PP has used following monitoring equipment. - Gasurveyors to detect any gas leakage and - HFS to measure any leakage detected. The details of the monitoring equipment are provided below: <table border="1"> <tr> <td>Instrument Name</td><td>Hi Flow Sampler</td></tr> <tr> <td>Manufacturer</td><td>Health Consultants</td></tr> <tr> <td>Serial Numbers</td><td>16020932 16020933 16020936</td></tr> <tr> <td>Accuracy Class</td><td>+/- 10 %</td></tr> <tr> <td>Calibration Frequency</td><td>Monthly</td></tr> <tr> <td>Date of calibration</td><td>19/01/2022, 14/02/2022, 13/03/2022, 07/04/2022, 28/04/2022, 25/05/2022, 23/06/2022, 21/07/2022, 18/08/2022, 17/09/2022, 25/10/2022, 17/11/2022, 13/12/2022</td></tr> </table> <table border="1"> <tr> <td>Instrument Name</td><td>Gasurveyor</td></tr> <tr> <td>Manufacturer</td><td>GMI</td></tr> <tr> <td>Serial Numbers</td><td>539910 539911 539912 513671</td></tr> <tr> <td>Accuracy Class</td><td>+/- 1 %</td></tr> <tr> <td>Calibration Frequency</td><td>Annual</td></tr> <tr> <td>Date of calibration</td><td>19/01/2022,</td></tr> </table> The verification team noted that the high flow sampler is calibrated every 30 days as per manufacturers' specifications while in use, with the date and signature of the person in-charge of the	Instrument Name	Hi Flow Sampler	Manufacturer	Health Consultants	Serial Numbers	16020932 16020933 16020936	Accuracy Class	+/- 10 %	Calibration Frequency	Monthly	Date of calibration	19/01/2022, 14/02/2022, 13/03/2022, 07/04/2022, 28/04/2022, 25/05/2022, 23/06/2022, 21/07/2022, 18/08/2022, 17/09/2022, 25/10/2022, 17/11/2022, 13/12/2022	Instrument Name	Gasurveyor	Manufacturer	GMI	Serial Numbers	539910 539911 539912 513671	Accuracy Class	+/- 1 %	Calibration Frequency	Annual	Date of calibration	19/01/2022,
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Serial Numbers	539910 539911 539912 513671																								
Accuracy Class	+/- 1 %																								
Calibration Frequency	Annual																								
Date of calibration	19/01/2022,																								

	calibration, recorded in the calibration records /20/. The Gasurveyor is calibrated as per manufacturer specifications at least once per year. The results of calibration of both the equipment are found within the permissible limits. Calibration was done internally by trained personnel of PSL by MBS /23/. Competence of the calibrating persons could be confirmed during the on-site interviews by the verification team including through a live demonstration of the same. It was noted from Calibration records /20/ that for all the three Hi-Flow Samplers (Sl. No. 16020932, 16020933, 16020936), the calibration frequency was adhered except on one occasion, where there was a delay of 9 days (From 17-Sep-2022 to 25-Oct-2022) due to unavailability of Calibration gas cylinder. This is listed in MR in section 4.3. The verification team noted that in the period of delay with calibration, the specific HFS (<i>in this case, all the three HFS</i>) with outdated calibration were not used by the operators. This can be confirmed by the verification team via interviews held with Mr. Tuhin Shuvra Ghosh (calibration manager) and Mr. Tanvir (Deputy Project manager) and operators Mr Md. Golam Mourtouza (From Leak detection team). In addition, the dates of leak flow measurements were compared with the data in Operational Logs /15/ and it can be concluded that all measurements were made with HFS within the valid calibration period of one month. Hence, the verification team concludes that this approach as more reliable than a strict application pattern of the one-month-period for calibration. This is because measurements are undertaken in a discrete manner rather than continuously. Overall, the verification team confirms that calibration of HFSs and Gasurveyors were performed in line with the calibration requirements as stated in Monitoring Plan in PDD/27/. Thus the verification team concluded that monitoring equipment used for monitoring is controlled and calibrated in accordance with the registered monitoring plan. Monitoring results are consistently recorded as per the approved frequency.
Measuring/Reading/Recording frequency	The parameter is measured annually as verified through document review and on-site inspection. The measuring and recording frequency are hence in compliance with the registered PDD and the applied methodology.
Data collection (from data generation, aggregation, to recording, calculation and reporting)	The implementation and maintenance of procedures on baseline selection, recording of leaks, monitoring of repaired Leaks along with their quality control and assurance were verified by the verification team during the on-site inspection. During on-site assessment it could be verified that the aforementioned data of both recorded and repaired leaks is documented by the LDMT in Hard Copy Protocols /15/, weather-proof tags, photographs and Data Log Files /15/ of the Hi-Flow

	Sampler, and is further processed by this LDMT into individual Leak Report Files /15/ containing also the exact location of the corresponding leaks. After all the information is transcribed into the Leak Report Files /15/ and checked, the LDMT transfers these files to the database manager who is responsible to enter these data into the CER Calculation Spreadsheets /2.2/. Upon the randomly selected sample points, the verification team during on-site assessment checked successfully the consistency of this data management system and its redundant data recorded. The existing data management system, and its correspondence with monitoring plan in PD /06/ can be also confirmed by the verification team via interviews held during on-site visit with Project Manager, Mr. Shah Ashequr Rahman and Deputy Project Manager, Mr. Tanvir. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan.
Verified value	See ER calculation sheet for the values of each j and z. Following the requirements of AM0023 / Version 4, at least two measurements were taken of every leak before the repair was made in order to record the level of project leak rate in correct manner. Two measurements are well documented in HFS memory /16/ and have been cross-checked by verification team in CER calculation spreadsheets /2.2/ with HFS records /16/ and Operational logs /15/ for all 75 randomly chosen leak points, subjected to assessment for verification purposes.
Cross checks	The value of parameter has been cross-checked during the on-site inspection with the readings recorded in the Leak tags for the sampled leak points and noted no deviations. The verification team noted that in some small number of cases, access to the repaired equipment was blocked (construction sites, street repairs, etc.) preventing the monitoring teams from accessing leak repairs to monitor them. In order to ensure the results are conservative, no Emission Reductions were claimed in this period for those leaks that were not able to be monitored. (Example: GA-R.3.RR.356.1). During field inspection of all 75 randomly chosen sample points mentioned in Section 2.1 the leak tightness of all samples have been checked by the verification team using Gasurveyors where the leak repairs have taken place. This technique is well established for easily identifying leaks and, as described in the registered PDD /27/, has been applied also by the PP's LDMT for leak detection. It was verified all the sample points showed complete leak repair effectiveness. As a result, the verification team concluded that leak flow measurements for the project is performed correctly and deviations were not observed and the quality of leak repairs is good and is in line with provisions of PDD /27/. In addition, the verification team performed the overall check of leaks databases on-site in order to check that the QC/QA procedures for the Leak Rate $F_{CH4,i}$ parameter are followed. The verification team noted no deviations.

6. Data/Parameter, Unit: BE_{CAP} - Capped quantity of the baseline emissions, defined as the baseline emissions for the first year of the crediting period (tCO_{2e})

The assessment for the monitoring parameter is given below:

	Discussion and verification assessment
<i>Purpose of data</i>	Capped quantity of emissions that can be claimed
<i>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</i>	Measured and calculated based on baseline emissions during the first year of the crediting period. Measurements of leaks taken with Hi-Flow Samplers
<i>Measuring/Reading/Recording frequency</i>	Once during baseline and calculated. Calculated after the baseline leak detection and repair period is completed The measuring and recording frequency are hence in compliance with the registered PDD and the applied methodology.
<i>Data collection (from data generation, aggregation, to recording, calculation and reporting)</i>	Measured and calculated based on baseline methane emission reductions reduced in first year of the crediting period. Calculated from verified baseline methane emissions. Hence, the verification team confirms that the Quality Assurance and Quality control procedures have been applied in accordance with the registered monitoring plan.
<i>Verified value</i>	4,315,391 tCO_{2e} The value is verified in the Emission Reduction spread sheet and from registered PDD.
<i>Cross checks</i>	The data management ensures correct transfer of data and reporting of the value and all necessary QA/QC processes are in place.

The assessment of the audit history is provided below.

Audit Type	Period	Program	VVB Name	Number of years/months and days
CDM Validation	17-March-2015 (Registration date)	CDM – UNFCCC	DNV	-
1 st Verification	29-January 2017 to 22-December-2018	CDM	TÜV SÜD South Asia Pvt. Ltd	1 year and 11 months
2 nd Verification	23-December-2018 to 07-November-2019	CDM	TUV SUD South Asia Pvt Ltd.	10 months and 19 days
3 rd Verification	08-November-2019 to 31-December-2020	CDM	TUV SUD South Asia Pvt Ltd.	14 months
VCS Gap Validation	04-November-2022 (Validation report issuance date)	VCS	Carbon Check (India) Private Ltd.	-
4 th Verification	01-January-2021 to 31-December-2021	VCS	Carbon Check (India) Private Ltd.	1 year
5 th Verification	01-January-2022 to 31-December-2022	VCS	KBS	1 year
Total	15-June-2011 to 14-June-2017	-	-	7 years

The verification team confirmed the above details from the CDM and VCS website/29/ and found to be accurate.

Remaining Issues from Validation or Previous Verification:

This is the fifth verification (2nd verification in VCS) of the registered project activity. From the review of validation report and previous verification reports, verification team confirms that no FAR was to be addressed during this verification.

4.2 Safeguards

4.2.1 No Net Harm

Not applicable as the project does not pose any potential negative environmental and socio-economic impact.

4.2.2 Local Stakeholder Consultation

The local stakeholder consultation meetings were held during the CDM validation. Also, ongoing communication with local stakeholders has been stated in section 2.2 of the MR /1.1/. To undertake the monitoring activity, the monitoring teams visit every riser included in the database during each monitoring period. In the process of conducting the monitoring, they regularly meet the customer and explain that they are repairing and maintaining leaks and receive regular feedback from the customers. In addition, the gas company maintains a customer service line and any issues that arise are passed to the teams as needed. TITAS also maintains a log of any complaints/emergency leakage. All the complaints are found to be addressed on a timely manner.

The verification team confirms the procedure and method for engagement, the method for documenting the outcomes of the consultation, and the account of all inputs received. The verification team confirms that the project proponent has taken due account of all input (no negative comments were received for the project). Hence the verification team deemed the local stakeholders meeting procedure including the inputs received as appropriate.

4.3 AFOLU-Specific Safeguards

This is a non-AFOLU project and hence this section is not applicable.

4.4 Accuracy of GHG Emission Reduction and Removal Calculation

The equations and choices provided in the methodology and all other methodological tools are correctly quoted in the MR /1.2/. The emission reductions of the project are calculated using the formulae mentioned in the applied methodology AM0023 version 04 /26/. The verification team has reviewed the emission reduction spreadsheets (ER sheets) and checked all the formulae and found they are correct and are in accordance with the monitoring plan of the PD and the applied monitoring methodology.

The verification team checked the Emission Reduction calculation sheet /2.2/ and confirms that the equations used have been correctly applied and as per the selected methodologies AM0023 “Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities”, version 04 /26/ and the registered CDM PDD /27/.

Baseline emissions:

Baseline emissions are determined based on the quantity of CH₄ emitted through physical leaks that are detected and repaired as part of the project activity (i.e., by the advanced LDAR program).

Option 2 of the methodology AM0023 /26/ has been chosen to measure the flow rate of the physical leaks through the use of a Hi-Flow Sampler. In addition, the baseline emissions are capped to the baseline emission level for the first year of the crediting year, which is again as per the methodology.

The baseline emissions are calculated as follows:

$$BE_y = \min \left\{ BE_1, ConvFactor \times \sum_j [F_{CH_4,j} \times T_{j,y} \times (1 - UR_j)] \times GWP_{CH_4} \right\}$$

With,

$$BE_1 = ConvFactor \times \sum_j [F_{CH_4,j} \times T_{j,y=1} \times (1 - UR_j)] \times GWP_{CH_4}$$

Where:		
BE_1	=	Baseline emissions for the first crediting year of the crediting period (tCO ₂ e).
BE_y	=	Baseline emissions for crediting year y (tCO ₂ e)
ConvFactor	=	Conversion factor to convert Nm ³ CH ₄ into tCH ₄ . The Hi-Flow sampler automatically accounts for standard temperature and pressure in data readings; as such this factor amounts to 0.0007168 tCH ₄ /Nm ³ CH ₄ (i.e., 0 degree Celsius and 101.3 kPa).
j	=	All physical leaks that are included in the project activity for which physical leaks were detected and repaired and which would leak in the baseline scenario during the crediting year y.
$F_{CH_4,j}$	=	Measured flow rate of methane for the physical leak j from the leaking component (Nm ³ CH ₄ /h)
UR_j	=	Uncertainty range for the flow rate measurement method applied to physical leak j. The uncertainty of the measurement is taken into account by using the flow rate at the lower end of the uncertainty range for the measurement at a 95% confidence interval for baseline emissions from leaks
$T_{j,y}$	=	The time the relevant component, in which physical leak j occurred, would leak in the baseline scenario and would be eligible for crediting during the crediting year y (hours)

GWP _{CH4}	=	The global warming potential for methane valid for the commitment period (tCO ₂ e/tCH ₄). After the commitment period, this value may be revised based on any decision by the CMP.
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Uncertainty is calculated using the following formula.

$$UR_j = \frac{\sqrt{(UR_1 * x_1)^2 + (UR_2 * x_2)^2 + \dots + (UR_n * x_n)^2}}{x_1 + x_2 + \dots + x_n}$$

Where

UR_j = the percentage uncertainty in the sum of the quantities (half the 95% confidence interval divided by the total (i.e. mean) and expressed as a percentage);

x_n and UR_n = the uncertain quantities and the percentage uncertainties associated with them, respectively.

(Note: “n” in this case refers to each recorded leak rate of each component surveyed)

For all physical leaks detected, the following assumptions are applied in calculating the baseline emissions:

- For components where no physical leaks were detected at the initial baseline survey and where the physical leak(s) were detected during a subsequent survey, baseline emissions shall be accounted from the moment when the leak was detected;
- Baseline emissions from a specific leak *j* or a specific component *r* are included in the calculations until whichever of the following occurs first:

Further, the information provided in the monitoring report has been cross-checked with other sources such as detailed log sheets of all leaks /15/, to confirm the correctness and for plausibility check. The calculation of baseline GHG emissions has been carried out in accordance with the formulae and methods described in the registered monitoring plan and the applied methodology. Any assumptions used in emission or removal calculations have been justified. Appropriate emission factors, IPCC default values, GWPs, and other reference values have been correctly applied. The verification team also confirms that there is no material misstatement in the calculation of reported baseline emissions.

Project emissions:

For project emissions, it is required to include physical leaks that take place on components included in the project boundaries in the following cases:

- If a repair of a physical leak ceases to function, for as long as it is not repaired again; or
- If a new physical leak is detected in a component that was part of the initial baseline survey and for which no physical leak was detected during that survey, as long as that physical leak is not repaired.

Project emissions are calculated using the following formula (Option 2):

$$PE_y = ConvFactor \times \sum [F_{CH_4,z} \times T_z \times (1 - UR_z)] \times GWP_{CH_4}$$

Where:

Where:		
PE _y	=	Project emissions in crediting year y (tCO ₂ e)
ConvFactor	=	Conversion factor to convert Nm ³ CH ₄ into tCH ₄ . The Hi-Flowsampler automatically accounts for standard temperature and pressure in data readings; as such this factor amounts to 0.0007168 tCH ₄ /Nm ³ CH ₄ (i.e., 0 degree Celsius and 101.3 kPa).
z	=	All leaks that are accounted for as project emissions during the crediting year y
FCH _{4,j}	=	Measured flow rate of methane for the physical leak j from the leaking component (Nm ³ CH ₄ /h)
UR _z	=	Uncertainty range for the flow rate measurement method applied to physical leak z. The uncertainty of the measurement is taken into account by using the flow rate at the lower end of the uncertainty range for the measurement at a 95% confidence interval for baseline emissions from leaks.
T _z	=	The time the relevant component has been leaking during the

		crediting year y
GWPC _{H4}	=	The global warming potential for methane valid for the commitment period (tCO ₂ e/tCH ₄). After the commitment period, this value may be revised based on any decision by the CMP.

The following assumptions are made in the calculation of project emissions:

If a repair of a physical leak ceases to function, it is conservatively assumed that the leak resumed either:

- At the same flow rate that was measured before its repair when using only leak detection equipment;
- At the newly measured leak rate if the leak is re-measured using leak measurement equipment at the time of monitoring (in case of Option 2);

It is further assumed that the leak resumed on the day when the leak was last checked and confirmed not to leak and that it continued to leak for the entire time since that date. Thus, leaks, where the repair failed and are not immediately re-repaired, are included in the project emissions.

For components where no physical leak was detected at the initial baseline survey and where the physical leak(s) were detected during subsequent survey, project emissions from these components shall be accounted since the moment when the leak was detected.

Project emissions from a specific physical leak are included in the calculations until whichever of the following are earlier:

The date of any repair of the physical leak as long as the repair does not cease to function; or the equipment concerned is replaced (i.e. it breaks down).

During the current monitoring period, there are no project emissions for the project activity.

As per the applied methodology AM0023, version 04 /26/ no leakage effects are accounted for. Thus, there will no leakage emissions from the project activity.

According to the applied methodology, the emission reductions are calculated as:

$$ER_y = BE_y - PE_y$$

From the above-calculated value of BE_y and PE_y, the total emission reductions are:

$$ER_y = 4,135,618 \text{ tCO}_2\text{e}$$

The verification team confirms that all parameters are used correctly in the calculations, all results are verifiable and transparent, all assumptions are described and based on verifiable evidence, and calculations are done in accordance with the pre-defined formulae from registered PD /06/. As the measuring instruments directly read out the amount of methane leakage rate per unit time, the “sample gas methane concentration” and “ambient air methane concentration” parameters are rendered redundant in the calculation of ER. The total number of emission reductions achieved during the monitoring period is 4,135,618 tCO₂e.

Emission reductions have been calculated in accordance with the applied methodology AM0023, version 04 /26/, and VCS PD /06/. The PP has used monitored data and ex-ante fixed data including default values as mandated/permitted by the applied methodology. The values used for the calculation of GHG emission reductions have been thoroughly checked by the verification team and were found appropriate and correct.

Parameters Determined ex-ante

The following parameters are determined ex-ante and mentioned in the CDM PDD / VCS PD:

Parameter	Unit	Value	Assessment
GWP _{CH4}	tCO ₂ e/tCH ₄	28	Fixed ex-ante from the 5 th Assessment Report of the IPCC which is in accordance with the VCS Standard, version 4.3 and deemed acceptable.
ConvFactor	tCH ₄ / m ³ CH ₄	0.0007168	The value of the parameter is fixed ex-ante in the PDD. As per the methodology the leak flow rate (F _{CH₄,i}) and conversion factor (ConvFactor) should be reduced to the same reference conditions. The verification team has checked that the Hi-Flow Samplers automatically accounts for standard temperature and pressure (i.e., 0 degree Celsius and 101.3 kPa) in its leak flow rate measurements.

The spread sheet submitted by the PP clearly and transparently mentions values of the data parameters used for calculation of emission reductions. The input values have been verified from the reliable and authentic sources including monitoring records, MR /1.1/, and applied methodology /26/. The total number of emission reductions for the monitoring period (01-January-2022 to 31-December-2022) is 4,135,618 tCO₂e.

The emission reductions calculated were compared with the emission reduction spread sheet /2.2/ and found to be correct. No significant reporting risks have been identified for the data reported.

Opinion: The verification team confirms;

- The monitoring plan has been implemented as per the registered PD /06/;
- The monitoring complies with the requirement of the applied methodology/26/;

- The information inflow (from data generation, aggregation, to recording, calculation and reporting) is included above under each parameter and confirms to the requirement of the PD /06/;
- The values included in the monitoring report /1.2/ and corresponding emission reduction sheet /2.2/ are verified and included under each monitoring parameter, wherever appropriate.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

When verifying the report emission reduction, KBS ensured that there was a clear audit trail that contained the evidence and records that validate the stated figures. All source documents that form the basis for assumptions and other information underlying the GHG data are shown above.

When assessing the audit trails, KBS also examined:

1. Whether sufficient evidence was available, both in terms of frequency and in covering the full monitoring period
2. The source and nature of the evidence
3. If comparable information was available from sources other than that used in the monitoring report,

KBS cross-checked the monitoring report against the other sources to confirm that the stated figures were correct. The sources and the data referenced are shown in Appendix 1 below.

The verification team confirms that all the monitoring equipment has been provided to adhere to the monitoring requirement as specified in the project activity as per the registered monitoring plan. All Hi-Flow Samplers and Gasurveyors are calibrated to ensure accuracy in their measurements. The calibration is done as per the PDD at 30 day and one-year frequency for HFS and GS respectively, by certified and trained staff on the calibration procedure. The results of calibration are found to be within the permissible error limits. The verification team confirms that HFS and GS used for monitoring leaks were duly calibrated at the time of their usage for the current monitoring period. The Verification team checked the calibration records and the same was found to be satisfactory /20/.

KBS also assessed that the data collection system met the requirements of the monitoring plan as per the applied methodology. Proper data management inclusive of data acquisition and aggregation, data management system is being followed for the project activity. The monitoring personnel at the site are well trained and follow reproducible routines. Thus, they are competent to carry out the relevant tasks with sufficient accuracy.

4.6 Non-Permanence Risk Analysis

Not Applicable

5 VERIFICATION CONCLUSION

The Project Participant, NEClimate A/S, has commissioned the VVB, KBS Certification Services Limited to perform verification of the VCS Project Activity “Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh” for the monitoring period 01-January-2022 to 31-December-2022 (including both days) under the crediting period 29-January-2017 to 28-January-2027, with regard to the relevant requirements of VCS Standard Version 4.4.

The management of the ‘NEClimate A/S’ is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project final Monitoring Report, Version 2 dated 26-July-2023. The calculation and determination of GHG emission reductions from the project is the responsibility of the management of the ‘NEClimate A/S’. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report, Version 2, dated 26-July-2023.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the period 01-January-2022 to 31-December-2022 (Inclusive of both days) based on the reported emission reductions in the final Monitoring Report Version 2, dated 26-July-2023 for the same period.

The selected baseline and monitoring methodology (AM0023, Version 04) applies to the project and correctly applied.

As a result of the verification, the verification team confirms that:

- All operations of the project are implemented and installed as planned and described in the project description.
- The monitoring system is in place and functional.
- The installed equipment/materials essential for generating emission reductions runs reliably.
- The GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, KBS planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated. The verified and certified emission reductions for the MP from 01-January-2022 to 31-December-2022 is **4,135,618 tCO₂e**.

Verification period: From 01-January-2022 to 31-December-2022 (Inclusive of both days).

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

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01-January-2022 to 31-December-2022	4,135,618	0	0	4,135,618

The estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for this monitoring period and the percentage difference and justification for the difference are stated below.

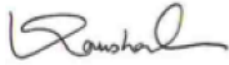
Ex-ante emissions reductions/removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
3,950,039 tCO ₂ e	4,135,618 tCO ₂ e	4.7 %	The verification team noted that the estimate Ex-ante (available in section 1.10 of the VCS PD) are based on the Gap Analysis estimates done as part of the registration of the project with VCS. The actual results are quite close to the estimate are reflected in the achieved results.

The verification team is of the opinion that the project has been implemented in accordance with the registered project description, the MP complies with the approved monitoring methodology, the monitoring complies with the MP, and the monitored data and calculation of ERs are assessed and confirmed as correct.

Therefore, KBS hereby certifies and requests the issuance of, the reported ERs during the monitoring period of 01-January-2022 to 31-December-2022 amounting to 4,135,618 tCO₂e to the VCS Registry.

Location: Faridabad

Date: 15-September-2023



Authorized Signatory: Kaushal Goyal

Designation: Managing Director

KBS Certification Services Limited

APPENDIX 1: REFERENCE DOCUMENTS

Ref	Document
/01/	/1.1/ Monitoring report version 1, dated 04-May-2023 (Initial Version) /1.2/ Monitoring report version 2, dated 26-July-2023 (Final Version)
/02/	/2.1/ Emission Reduction calculation sheet dated 04-May-2023 (corresponding to initial Version of VCS MR) /2.2/ Emission Reduction calculation sheet, dated 26-July-2023 (corresponding to final Version of VCS MR)
/03/	Evidence for the project start date on 29-January-2017
/04/	Proof of project ownership complying with section 3.6.1 of VCS Standard version 4.3 (agreement between NE Climate A/S and Titas Gas Company, dated 06-Dec-2012)
/05/	Company registration certificate for the PP
/06/	VCS PD for the “Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh” version 2.2, dated 03/11/2022, and ex-ante emission reduction estimation spreadsheet
/06a/	VCS – Gap Validation and Verification Report dated 04-November-2022
/07/	Map – Transmission and distribution pipeline of TGTDC
/08/	“Gas leak project service agreement” / contract between NE Climate, Climate Compass LLC, and PSL, dated 25-October-2021
/09/	Organization structure for the project activity
/10/	Baseline study from 29-January-2017 to 28-January-2018
/11/	Summary report from MBS for the project monitoring including inspection visits and monitoring database dated 23-Jan-2023.
/12/	Evidence for the lifetime of the repair materials used in the leak repairs – Letter from MBS dated 23-May-2023
/13/	Log of the materials used for leakage repairing using advanced LDAR
/14/	Leak Tags of randomly chosen sample points, verified during on-site assessment.
/15/	Operational Logs - Detailed log sheets of all leaks with leak code, photographs, data log files and GPS coordinates.
/16/	HFS Memory
/17/	Technical specifications and manuals for the Hi-Flow Samplers and GMI Gas surveyor (500 Series) and Photographs of the HFS and GS used during the monitoring period
/18/	Deed concerning calibration to perform the calibration of HFS
/19/	Evidence to confirm the Hi-Flow Sampler automatically accounts for standard temperature and pressure (i.e.,

	0 degrees Celsius and 101.3 kPa) in its leak flow rate (FCH _{4,j}) measurements
/20/	Calibration records for all the Hi-Flow Sampler and GS used during the monitoring period
/21/	Statutory Documents: - Natural Gas Safety and Security Law - Gas distribution rules (Domestic) & (Industry) - Gas Act - Gas Marketing Law
/22/	Letter from TGTDCCL confirming system outages in gas supply during the monitoring period, dated 15-Feb-2023
/23/	Training evidence along with competence of the personnel involved in the monitoring
/23a/	Evidence for employment generated by the project
/24/	Declaration(s) from Project proponent on the following dated 08-June-2022: a. Project not registered or under the process of registration in any other Emissions Trading Programs and Other Binding Limits b. Project not registered or in process of getting Other Forms of Environmental Credit c. The project has not been registered and is not seeking registration under any other GHG program d. Projects not Rejected by Other GHG Programs e. Declaration from PP confirming that the project is not claiming any other environmental credits other than VCUs f. All repair works are carried out in compliance with “National Gas Security Law” also known as “Prakitik Gas Nirapatta Bidhimala, 1991 –Revised in 2003” and other Bangladesh regulatory requirements
/25/	VCS Requirements a. VCS Standard, version 4.4 b. VCS Program Guide, version 4.4 c. VCS Validation and Verification Manual, version 3.2 d. Registration & Issuance Process, version 4.3 e. VCS Program Definitions version, version 4.3 f. VCS MR template version 4.2
/26/	Applied baseline and monitoring methodology AM0023, version 04, “Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities”
/27/	Registered CDM PDD for CDM project “Reducing Gas Leakages within the Titas Gas Distribution Network in Bangladesh” and the corresponding validation report including documents related to the first, second and third CDM monitoring periods

/28/	a. “Standard for sampling and surveys for CDM project activities and program of activities” (version 09.0) b. Guidelines for sampling and surveys for CDM project activities and Program of Activities (version 04)
/29/	Website and links: 1. http://cdm.unfccc.int 2. http://www.terra.org

APPENDIX 2: ABBREVIATIONS

CDM	Clean Development Mechanism
BE	Baseline Emission
CAR	Corrective Action Request
KBS	KBS Certification Services Limited.
CDM	Clean Development Mechanism
CL	Clarification Request
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
DOE	Designated Operational Entity
DPR	Detailed project report
DVR	Draft Verification Report
EB	CDM Executive Board
EF	Emission Factor
ER	Emission Reduction
FAR	Forward Action Request
FVR	Final Verification Report
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HFS	Hi Flow Sampler
IPCC	Intergovernmental Panel on Climate Change
LDAR	Leak detection and repairs
NA	Not Applicable
MBS	MBS Ltd.
PD	Project Description
PP	Project Proponent
PSL	Prokaushali Sangsad Limited
QC/QA	Quality control/Quality assurance
TGTDCL	Titas Gas Transmission and Distribution Company Ltd.
TR	Technical Review
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit
VVB	Validation Verification Body
VVM	Validation and Verification Manual
VVS	Validation and Verification Standard

APPENDIX 3: CERTIFICATES OF COMPETENCE

Personnel Name		Srinivasan Selvaraj			
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☐ Other GHG Schemes (mention here)
Qualified to work as					
Team Leader			☒	Technical Expert	☒
Validator/Verifier			☒	Financial Expert	☐
Technical Reviewer			☐	Local Expert (India)	☒
Area(s) of Technical Expertise					
Sectoral Scope			Technical Area		
SS 01: Energy Industries (Renewable/non-renewable sources)			TA 1.2: Energy generation from renewable energysources		
SS 03: Energy Demand			TA 3.1 : Energy Demand		
SS 5: Chemical industry			TA 5.1 Chemical industry		
SS 12: Solvents use			TA 12.1 Chemical industry		
SS 13: Waste handling and disposal			TA 13.1. Waste handling and disposal		
Approved by (Manager Competence & Training)			Dr. Rajesh Monga		
Approval date			25-08-2023		

Personnel Name:		Ms. Varsha Bohiya	
Qualified to work as:			
Team Leader	☐	Technical Expert	☐
Validator/Verifier (Trainee)	☒	Financial Expert	☐
Technical Reviewer	☐	Local Expert	☐
Area(s) of Technical Expertise			
Sectoral Scope		Technical Area	
-		-	
Approved by (Manager C & T)		Manager –Competence and training	
Approval date:		08-November-2021	

Personnel Name		Manoj K. M. Chaturvedi			
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☐ Other GHG Schemes (mention here)
Qualified to work as					
Team Leader			☐	Technical Expert	☒
Validator/Verifier			☐	Financial Expert	☐
Technical Reviewer			☐	Local Expert (Qatar)	☒

Area(s) of Technical Expertise	
Sectoral Scope	Technical Area
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1. Fugitive emissions from oil and gas
Approved by (Manager Competence & Training)	Manager C & T
Approval date	05-09-2019

Personnel Name		Syed Anwar Hossain			
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☐ Other GHG Schemes (mention here)
Qualified to work as					
Team Leader			☐	Technical Expert	☐
Validator/Verifier			☐	Financial Expert	☐
Technical Reviewer			☐	Local Expert (Bangladesh)	☒
Area(s) of Technical Expertise					
Sectoral Scope			Technical Area		
-			-		
Approved by (Manager Competence & Training)			Shikha Sharma		
Approval date			14-11-2022		

Personnel Name		Ravi Kumar Prabhu				
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☐ Other GHG Schemes (mention here)	
Qualified to work as						
Team Leader			☒	Technical Expert		☒
Validator/Verifier			☐	Financial Expert		☐
Technical Reviewer			☒	Local Expert (India)		☒
Area(s) of Technical Expertise						
Sectoral Scope			Technical Area			
SS: 01: Energy industries (renewable/non-renewable sources)			TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricityfrom solar			
			TA 1.2: Energy generation from renewable energy sources			
SS 5: Chemical industry			TA 5.1 Chemical industry			
SS 12: Solvents use			TA 12.1 Chemical industry			
SS 13: Waste handling and disposal			TA 13.1. Waste handling and disposal			
Approved by (Manager Competence & Training)			Shikha Sharma			
Approval date			06-08-2022			

Personnel Name	Govinda Rao Pitta				
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☐ Other GHG Schemes (mention here)
Qualified to work as					
Team Leader	☐	Technical Expert			☒
Validator/Verifier	☐	Financial Expert			☐
Technical Reviewer	☐	Local Expert (Qatar)			☒
Area(s) of Technical Expertise					
Sectoral Scope			Technical Area		
SS 10: Fugitive emissions from fuels (solid, oil and gas)			TA 10.1. Fugitive emissions from oil and gas		
Approved by (Manager Competence & Training)			Manager C & T		
Approval date			31-08-2020		

APPENDIX 4: FINDINGS

Summary of findings	CL	CAR	FAR
	2	2	-

Table 1. Remaining FAR from validation and/or previous verifications (Applicable for verification)

FAR ID		Section no.		Date: DD/MM/YYYY
Description of FAR				
Project participant response		Date: DD/MM/YYYY <i>(please mention the date of your response to KBS)</i>		
<i>Please mention the response in this box.</i>				
Documentation provided by project participant				
<i>Please mention the document provided to KBS along with the above response.</i>				
DOE assessment		Date: DD/MM/YYYY		

Table 2. CL from this validation/verification

CL ID	CL 01	Section no.	4.3 of MR	Date: 25/07/2023
Description of CL				
PP is requested to clarify how the disconnection of user gas connection for commercial reasons (eg., Non-payment) during the period (From monitoring date to End-date of monitoring period) are tracked and how such information are accounted in ER calculations. Example: For the chosen sample Leak point, MD-5.24.CR.1.1, last monitoring happened on 08-November-2022. However, during the site assessment on 18-July-2023, the verification team noted that the gas connection to the user was disconnected for commercial reasons. Please clarify as to whether the disconnection happened before the end-date of MP-5 (i.e., before 31-December-2022) and if so, how they are accounted in ER calculations. Please provide supporting document for disconnection, if any.				
Project participant response				Date: 26/07/2023
<i>At the end of each monitoring period, the Gas Company provides a list of commercial disconnections and reconnections for the monitoring period. We use that list to populate the "outage" tab of the excel calculation sheet provided. In fact, we check this information on a regular basis and use our filed visits as a way to confirm information.</i>				
Documentation provided by project participant				
<i>List of Outages from Titas, Also Outage Tab on Excel ER Calculation sheet</i>				

DOE assessment	Date: 07/08/2023
The verification team noted the Gas company, TITAS, provides a list of commercial disconnections and reconnections for each year (<i>or the monitoring period</i>), at the end of each year (<i>or monitoring period</i>). For the monitoring period, 01-Jan-2022 to 31-12-2022, the Gas Company has provided such list on 15-Feb-2023. The PP has used the information to populate the “outage” tab of the excel calculation sheet. The verification team noted that the information on disconnection of the cited example, MD-5.24.CR.1.1, will appear in the list, provided for the year 2023 and duly considered in the ER calculation for the next monitoring period i.e., MP 6. The verification team noted the PP has duly accounted the hours of service for each outage/cutoff in the ER calculations. The ER calculations are correctly carried out for the current monitoring period. Hence this CL 01 is closed.	

CL ID	CL 02	Section no.	5.1 of MR	Date: 25/07/2023
Description of CL				
PP is requested to state the source of data used for ex-ante estimation of emission reductions for the crediting period and provide ER spreadsheet.				
Project participant response				Date: 26/07/2023
<i>The ex-ante estimation is taken directly from the PD registered under VERRA which was validated including the estimate of the ex-ante emission reductions. This can be confirmed on the VERRA Registry where the final PD is located.</i>				
Documentation provided by project participant				
<i>See the final registration PD https://registry.verra.org/app/projectDetail/VCS/2930</i>				
DOE assessment				Date: 07/08/2023
The verification team noted that ex-ante estimation is taken directly from the PD registered under VERRA which was validated including the estimate of the ex-ante emission reductions. This was confirmed on the VERRA Registry, from where the registered PD was downloaded. Hence CL 02 was closed.				

Table 3. CAR from this validation/verification

CAR ID	CAR 01	Section no.	MR	Date: 25/07/2023
Description of CAR				
The Monitoring report template used is not the latest version, version 4.2.				
Project participant response				Date: DD/MM/YYYY 26/07/2023
<i>The monitoring report has been revised using 4.2</i>				
Documentation provided by project participant				
<i>MR V2.0</i>				
DOE assessment				Date: 07/08/2023
The PP has submitted the monitoring report in latest version, 4.2. hence this CAR 01 was closed.				
CAR ID	CAR 02	Section no.	ER Spreadsheet	Date: 25/07/2023
Description of CAR				

For few of the leak points, no monitoring is carried out during MP-5 and no CERs are claimed for such leaks. However, following details are found filled in the CER spreadsheet.

- Difference between Baseline leak and Monitoring Measurement for period before monitoring date, (l/m)
- Difference between Baseline Leak and Monitoring Measurement for period after monitoring date or after Re-Repair for reemerged leaks or after repair new leaks till the end of the monitoring period, (l/m)

Example:

GA-R.3.RR.356.1

GA-R.3.RR.366.1

GA-R.3.RR.373.1

Project participant response	Date: DD/MM/YYYY 26/07/2023
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The equation made this calculation but since it did not calculate ERs, it did not seem to be a problem. I have updated the Excel sheet to eliminate these calculations.

Documentation provided by project participant

Revised Excel sheet

DOE assessment	Date: DD/MM/YYYY
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The PP has presented the revised ER sheet, wherein the said data are removed for the leak points, (where there is no monitoring during the monitoring period). Hence this CAR 02 is closed.

Table 4. FAR from this verification

FAR ID	FAR 01	Section no.	<i>Insert reference of protocol</i>	Date: DD/MM/YYYY
Description of FAR				
<i>Insert the issue raised</i>				
Project participant response				Date: DD/MM/YYYY
<i>NA.</i>				
Documentation provided by project participant				
<i>NA.</i>				
DOE assessment				Date: DD/MM/YYYY
<i>NA.</i>				