Livestock
Project Verification Protocol

Capturing and Destroying Methane from
Manure Management Systems

Version 2.2

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1 Introduction

The Climate Action Reserve's (Reserve) Livestock Project Verification Protocol provides guidance to ISO-accredited and Reserve-approved verification bodies for verifying greenhouse gas (GHG) emission reductions associated with installing a biogas control system (BCS), in accordance with the Reserve's Livestock Project Protocol.

This verification protocol supplements the Reserve's Verification Program Manual. It describes the core verification activities in the context of a livestock operation and provides information on project monitoring parameters.

The purpose of verification is to provide an independent review of data and information used to produce a GHG project report. It aims to ensure that a participant's emissions report meets the following quality criteria: completeness, consistency, accuracy, comparability, and transparency. The intended audience of the project verification protocol is approved verification bodies. However, livestock operators will also find it useful to review this document to develop a better understanding of the verification activities associated with reporting GHG reductions to the Reserve.

Verification bodies trained to verify livestock projects must read and be familiar with the following Reserve documents:

- Program Manual
- Verification Program Manual
- Livestock Project Protocol
- Livestock Project Verification Protocol

The Reserve's Verification Program Manual and industry-specific verification protocols are designed to be compatible with each other and are available on the Reserve website at http://www.climateactionreserve.org.

Only ISO-accredited verification bodies trained by the Reserve for this project type are eligible to verify livestock project reports. Approved verification bodies under the California Climate Action Registry's General Verification Protocol are not automatically permitted to verify project reports. Information about verification body accreditation is available at http://www.climateactionreserve.org/how/verification/how-to-become-a-verifier/.

2 Standard of Verification

The Reserve's standard of verification for livestock GHG projects is the Livestock Project Protocol. To verify a livestock operator's project report, verification bodies apply the verification guidance in the Verification Program Manual and this document to the standards described in the project protocol. The project protocol provides eligibility rules, methods to calculate reductions, performance-monitoring instructions, and procedures for reporting project information to the Reserve. The project protocol:

- Defines the GHG reduction project
- Defines project eligibility rules
- Delineates the project boundary
- Provides GHG reduction calculation methods
- Identifies procedures for project monitoring
- Describes project reporting parameters

Specifically, this verification protocol supports the verification of GHG reduction projects associated with the installation of a biogas control system that captures and destroys methane gas from anaerobic manure treatment and/or storage facilities on livestock operations.[1] The biogas control system must destroy methane gas that would otherwise have been emitted to the atmosphere in the absence of the project from uncontrolled anaerobic treatment and/or storage of manure.[2]

The biogas control system destroys methane associated with the management of livestock waste that would have otherwise been generated through uncontrolled, anaerobic manure treatment and/or storage and emitted to the atmosphere. Project verification occurs annually at a minimum. GHG reductions associated with the biogas control system are accounted for on an *ex-post* basis. Although projects must be verified annually at a minimum, the Reserve will accept verified emission reduction reports on a sub-annual basis, should the project developer choose to have a sub-annual verification schedule (i.e. monthly, quarterly, etc.).

[1] Biogas control systems (BCS) are commonly called digesters, which may be designed and operated in a variety of ways, from ambient temperature covered lagoons to heated lagoons to mesophilic plug flow or complete mix concrete tank digesters.

[2] The installation of a BCS at an existing livestock operation where the primary manure management system is aerobic (produces little to no methane) may result in an increase of the amount of methane emitted to the atmosphere. Thus, the BCS must digest manure that would primarily be treated in an anaerobic system in the absence of the project in order for the project to meet the definition of a GHG reduction project.

3 Core Verification Activities – Livestock Operations

Although the Reserve's Livestock Project Protocol provides explicit guidance to determine the GHG impact associated with installing a biogas control system, the focus of this verification protocol is on the process to undertake a review and verify a livestock operator's GHG reduction report. However, it does include a list of project parameters to monitor.

The Reserve's core verification activities are a risk assessment and data sampling effort developed to ensure that the risk of a reporting error is assessed and addressed through appropriate sampling and review. An illustration of the core verification process is provided in Figure 1, and a description of the three-step procedure is provided below. More detailed information about the core verification process can be found in the Reserve's Verification Program Manual.

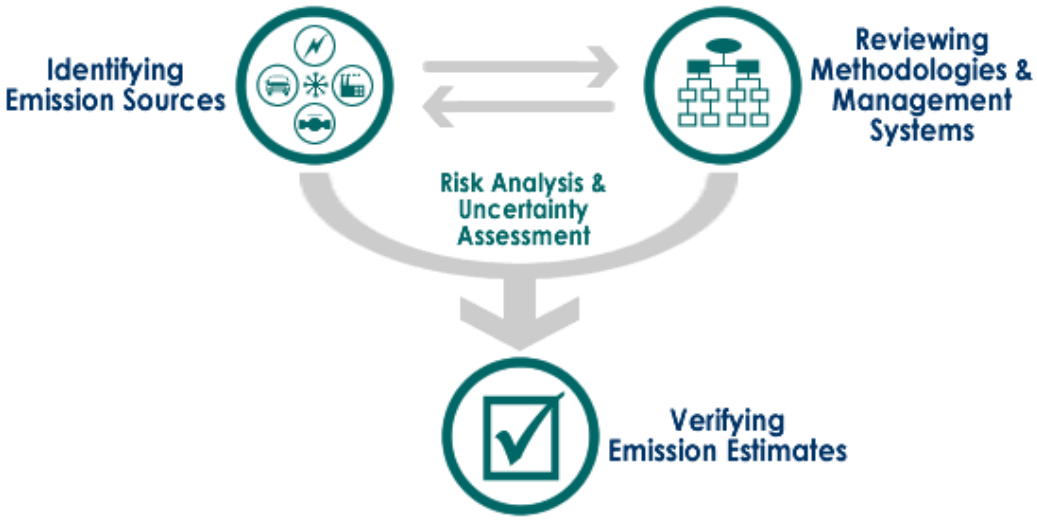

Figure 1. Core Verification Process.

The GHG reduction project's effects are determined within a GHG assessment boundary. The project protocol delineates the GHG sources and gases assessed by project developers to determine the net change in emissions associated with installing a biogas control system. The boundary captures sources, sinks, and reservoirs from waste production to disposal.

Within the defined GHG assessment boundary, project developers at livestock operations quantify the impact on methane and carbon dioxide by comparing modeled baseline emissions to modeled project emissions (sources of nitrous oxide are currently excluded from the boundary). Also, modeled methane emission reductions are compared to metered methane captured and destroyed and the lower of the two values is used for the quantification of project emission reductions. Therefore, a livestock operator's project report will consist of three main parts:

1. A modeled baseline emissions determination
2. A modeled project emissions determination
3. Metered methane captured and destroyed

The verification process identifies the emission sources, reviews data management systems, and verifies emission estimates for the modeled baseline scenario, the modeled project case, and the metered methane captured and destroyed to verify the project's GHG impacts.

Reserve verification bodies apply verification procedures consistently for all project developers.

3.1 Step 1: Identifying Emission Sources

Under this step, verification bodies review the project developer's emission source categories (waste production, collection and transport, treatment and storage, disposal) to ensure that all sources are identified – for both the baseline scenario and after project implementation.

Verification activities for the first year that a project is submitted to the Reserve include the review of project eligibility per the eligibility rules included in the project protocol. Also, every year a project report is submitted, project verifiers review the GHG emission report and document whether the report reflects the characterization and scope of the operation.

Questions to answer include:

1. Does the project meet the definition of the project as provided in the project protocol?
2. Does the project satisfy the eligibility criteria?
3. Did the project developer sufficiently attest to compliance with local, state, and federal air and water quality regulations?
4. Does the report correctly depict the manure management system under the baseline scenario and project case?
5. Does the project report include all methane and carbon dioxide sources within the assessment boundary – for the baseline case and after project implementation?
6. Does the project report include the total amount of metered methane captured and destroyed for comparison with the modeled methane emission reductions?

3.2 Step 2: Reviewing GHG Management Systems and Estimation Methodologies

After confirming the scope and comprehensiveness of the project developer's emission sources, verification bodies review the methodologies and management systems that the livestock operator used to calculate modeled baseline and project emissions as well as metered methane captured and destroyed. The objective is to assess the appropriateness of the data management systems that provide emissions information to the Reserve.

This is principally a risk assessment exercise, in which the verifier weighs the relative complexity of the scope of the project, the methodologies and management systems used to prepare the GHG project report, and the risk of calculation error as a result of reporting uncertainty or misstatement. A verification body's review of a project developer's GHG data collection and organization system should consider the following

questions, and be applied to the baseline and post-project case (as appropriate) as well as the metered methane captured and destroyed:

1. Are GHG sources within the project boundary correctly organized by source category?
2. Are the GHG sources differentiated by gas?
3. Are the livestock categories on the farm correctly differentiated?
4. For each livestock category, is the fraction of manure handled by the different manure management system components (i.e. GHG source) satisfactorily represented – the 'MS' value?
5. Did the project developer apply the correct VS and B_0 value for each livestock category?
6. Did the project developer use 'MCF' values differentiated by temperature?
7. For other calculation variables, did the project developer use correct data inputs?
8. Did the project developer apply the calculation methodologies at the GHG source level?
9. Did the project developer run the methane equations for each livestock category?
10. Did the project developer correctly aggregate methane emissions from sources within each livestock category?
11. Did the project developer correctly total fossil fuel use?
12. Did the project developer apply the correct carbon dioxide emission factors?
13. Did the project developer perform the comparison of modeled methane emission reductions and *ex-post* metered methane collected and destroyed, and use the lower of the two values for the quantification of project emission reductions?
14. Is the biogas control system operated in a manner consistent with the design specifications?
15. Are the biogas destruction devices operated and maintained in a manner consistent with design specifications?
16. Did the project developer correctly aggregate methane, carbon dioxide, and nitrous oxide emissions (if necessary)?
17. Did the project developer assess baseline and project emissions on a month-by-month basis?
18. Is an individual responsible for managing and reporting GHG emissions? Is this individual qualified to perform this function?
19. Is appropriate training provided to personnel assigned to GHG emission reporting duties?
20. If the project developer relies on external staff to perform required activities, are the contractors qualified to undertake such work? Is there internal oversight to assure quality of the contractor's work?
21. Are appropriate documents created to support and/or substantiate activities related to GHG emission reporting activities, and is such documentation retained appropriately? For example, is such documentation maintained through reporting plans or procedures, fuel purchase records, etc.?
22. Are the mechanisms used to measure and review the effectiveness of GHG emission reporting programs appropriate for this purpose? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?

Using answers to the above questions as a guide, the verification body assesses the overall risk of misstatement associated with the GHG management systems. To do this,

verification bodies evaluate the general quality and performance of the management systems and identify areas that could cause concern with data quality.

Verification bodies then identify the areas with the greatest potential for material misstatements (either based on volume of emissions, lack of management systems, or both) to determine the best risk-based strategy to identify a representative sample of emissions to recalculate in Step 3 below.

3.3 Step 3: Verifying Emission Estimates

Based on findings in the steps above, the verification body develops and implements a strategy to further investigate areas that have the greatest potential for material misstatements. By the end of this step, the verification body will either confirm or reject that material misstatement has occurred. This involves: (1) site visits to the project headquarters where in-depth review of the management system are conducted; and (2) recalculation of a representative sample of the emission estimates for comparison with estimates reported by the project developer.

At least one site visit is required to be conducted during each year of verification activities. While verification bodies may determine what type of sampling and site visits are appropriate to confirm a project developer's emissions, usually such activities include:

- Assessing data control systems at the facility level
- Reviewing documents such as livestock management records, fuel use records and emission monitoring results
- Recalculating emission estimates based on underlying activity data
- Generally attempting to detect material discrepancies by gathering different types of evidence

The final step in completing the core verification activities is to verify the emission estimates. To do so, verification bodies recalculate a subset of the livestock operation's emissions from the baseline case, post-project case, and metered methane captured and destroyed, and compare the sub-sample recalculated results with the project developer's calculated results from the same sources to determine if the GHG emissions inventory is free of material misstatements.[3]

Verification bodies must compare the emissions data and re-calculations to the project developer's emissions data and calculations for the same sources, and complete the following tasks:

1. Assess the areas of greatest impact and uncertainty in the emissions profile.
2. Select a representative sample of data to recalculate and sources to visit.
3. Develop and implement a strategy to recalculate the GHG emissions and visit the sources in the sample.
4. Assess the project developer's data collection.

[3] Based on a participant's identified emission sources, management systems, and corresponding risk profile of GHG emissions, verification bodies should select a representative sample of calculations to verify and sites to visit.

5. Compare estimated GHG emissions in the modeled baseline scenario, modeled post-project case, and the metered methane captured and destroyed to those of the project developer to determine if any material misstatements exist.

Verification bodies should concentrate their activities in areas that have the greatest impact to the net change in emissions due to installing a biogas control system. The verification of emission estimates should document the answers to the following questions:

1. Have you documented your process for determining the appropriate sampling plan?
2. Have you performed data triangulations where reasonable? Where more than one set of data is available for calculating emissions, a comparison can be performed as a check of the reported emissions.
3. Are the current year's baseline emissions, post-project emissions, and metered methane captured and destroyed significantly different from the prior year's emission levels? If so, do you understand the reasons for the changes, and to the best of your knowledge, do they explain the differences in emissions?
4. Are there any discrepancies between your emissions estimates and the participant's material?

It is possible that during the verification process differences will arise between the emissions estimated by the project developer and those estimated by the verification body. Differences of this nature may be classified as either material (significant) or immaterial (insignificant). If verification bodies discover reporting errors, they must determine if these errors, when extrapolated throughout the entire operation, will result in a material misstatement. This is typically achieved by performing a sensitivity analysis on the error with respect to the total reported emissions. A discrepancy is considered to be material if the overall reported emissions differ from the overall emissions estimated by the verification body by 5% or more. A difference is immaterial if this difference is less than 5%.

4 Completing the Verification Process

The Reserve's Verification Program Manual provides general instructions for verification bodies to finalize the verification process. It describes completing a Verification Report, preparing a Verification Opinion, conducting an exit meeting with the Reserve participant, and notifying the Reserve of the participant's verified status. Verification bodies are responsible for applying the guidance in a manner that meets the goals of project verification.