VERITAS

GTI ENERGY'S METHANE EMISSIONS MEASUREMENT + VERIFICATION INITIATIVE

ALL SEGMENTS

# Assurance

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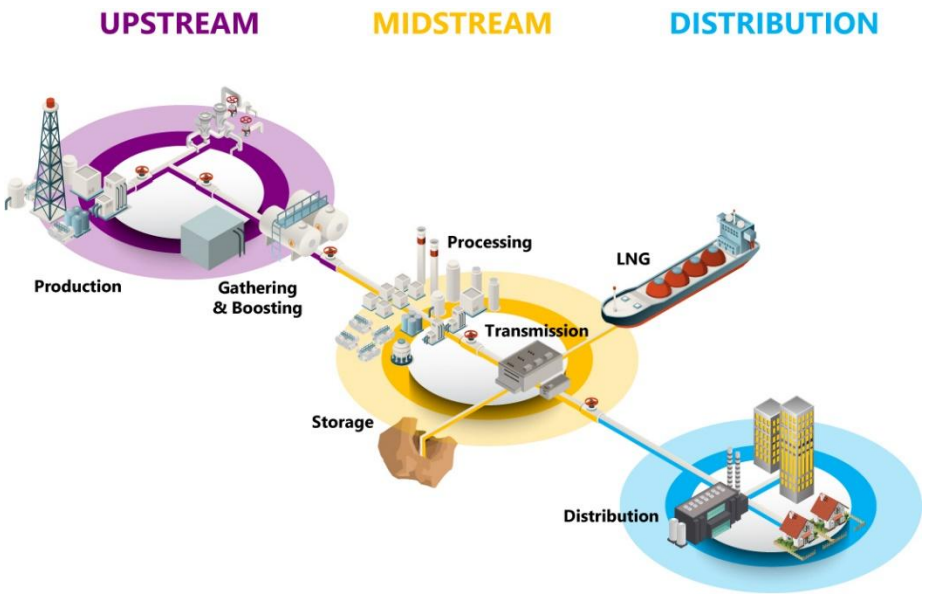


GTI ENERGY

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# Glossary

**Adopt:** Complete fulfillment of requirements set by a standard (*same as Conform for voluntary standards; same as Compliance for regulatory standards)*.

**Asset:** Part of the gas system owned by a natural gas company, comprising of multiple devices that allow the company to produce, process, transport, store, and/or distribute gas.

**Assurance:** The confirmation of a participant's adherence to a standardized methodology.

**Audit:** The verification of a participant's data, practices, reports, performance, and other records by an independent third-party entity other than the participant in question to determine if the participant's statement or declaration is materially correct and adheres to a predetermined set of criteria.[1]

**Auditable:** Designed to enable verification of a participant's progress towards a goal or adherence to a voluntary or binding initiative by an administering organization or independent third party.[2]

**Bottom-up Inventory:** Method based on engineering calculations, manufacturer data, and emissions factors for emissions sources/activities and corresponding activity factors. Emission calculations and factors sometimes including individual source measurements, compiled to develop an account of emissions discharged to the atmosphere from an asset (e.g., compressor station) or a geographic area (e.g., state, region, U.S. basin).[1]

**Confidence Bounds (or confidence interval):** A range of values around the sampled mean where a user can be confident that the true mean of the entire population exists. These are sometimes expressed as confidence bounds with upper and lower percentage differences compared to the sampled mean (i.e., 147 kg/hr ±32%). The percentage bounds may represent a 90%, 95%, or 99% confidence interval; the basis for the interval should be separately stated.

**Conservativeness:** The principle of choosing the cautiously moderate option among comparable choices of similar accuracy and completeness.

**Detection/Quantification Technology:** A gas sensing instrument, optionally configured with a deployment platform and/or ancillary instruments (e.g., anemometers, positioning), that can be used to gather data on emissions.[2]

**Detection:** The determination by a method that methane levels are above ambient background concentration.[2] In some cases, this may be an indication of a leak or an emission.

**Direct Measurement:** A method capable of determining the leak flow rate by capturing all the methane emitted by the source per unit time using a purposely created flow rate and a methane concentration.

**Emission Factor:** Describes typical methane emissions per unit of activity of a component or part of the gas system (e.g., valve, pipeline section) or from an event and can have units like [kg/km], [kg/event], or [kg/equipment].[1]

**Emissions Inventory:** A record of all known sources of emissions and the emission rates from those sources. An inventory provides an estimation of emissions over a given period of time.[1]

**Implement:** To put requirements and recommendations of a standard into practice (*same as Follow)*.

**Materiality:** The concept that individual misstatements or the aggregation of misstatements could influence the decisions by intended users of methane emission intensity, such as clients, regulators, etc.

**Materiality Threshold:** The level at which information is considered significant enough to impact the credibility and reliability of a statement or disclosure.

**Materiality (Emissions):** The significance of emissions contribution for assets or source categories (i.e., pneumatics, reciprocating compressors) in terms of total emissions. *This definition is not included in the Veritas Protocol but is included in the Veritas Source-Level Protocol. The numerical values presented here for materiality are for guidance only and operators can make individual decisions based on the sources and sites in their assets.*

- **Immaterial (<10% of total emissions):** Generally, immaterial sources and sites can be excluded from measurement campaigns. As annual improvements are made and other emissions sources are mitigated or eliminated, immaterial sources should be re-evaluated for potential future inclusion, as materiality of sources evolves over time.
- **Low Materiality (10-50% of total emissions)**: Sources and sites with lower materiality should be included in sampling strategies but can have less significant sample sizes. As annual improvements are made and other emission sources are mitigated, these sources can be evaluated further.
- **High Materiality (>50% of total emissions):** Sources with high materiality should be prioritized, and a higher percentage of the total population of sources should be included within the sampling plan for those sources of highest materiality. Understanding emissions from sources of high materiality is important for mitigation efforts.

**Measurement:** A qualitative (e.g., equipment type, presence/absence) or quantitative (e.g., emission rate in kg/hr) description of methane emissions resulting from the use of a measuring device or technology solution. These devices and technologies can be used to detect, localize, attribute, or quantify methane emissions.

**Measurement Informed Inventory (MII):** An inventory that is informed by data from measurements of the assets in the inventory. Traditional bottom-up inventories are often not based on facility-level measurements but on emissions factors. Examples of facility-level

measurements are determination of a single total emission rate for an entire facility, or measurement methods that when combined give a total facility-level result for facilities such as a compressor station, a well pad, or a central production facility.

**Measurement Method:** Combines a technology, a work practice, and analytics for use in a measurement program. A method must clearly state any mandatory actions to be performed as part of the work practice, along with suitable operating conditions for the technology. These can include environmental conditions, limitations on facility types, technology configurations, and deployment procedures.[2]

**Methane Intensity:** The ratio of methane emissions (numerator) over a selected variable (denominator).[1] While the denominator can vary, common selections include gross volume or mass of produced gas or methane, volume or mass of marketed (or sales) gas, volume or mass of gas or methane transported (i.e., throughput), or total energy content of the products or gas produced or transported.[3]

**Quantification:** Determining an emission rate, such as mass per time or volume per time. This can be done directly through measurement of the emissions, or indirectly through estimations, calculations, and modeling.[1]

**Reconciliation:** Combining top-down measurements with a bottom-up inventory into an improved emissions estimate.

**Reporting Period:** Period of time for which the methane emissions are estimated.

**Segment:** Part of the complete gas value chain. The oil and gas industry is usually divided into six major segments: production, gathering & boosting, processing, transmission & storage, distribution, and LNG. Veritas covers these six segments but combines them as follows: production and gathering & boosting form upstream; processing, transmission & storage, and LNG form midstream, and distribution by itself. The U.S. EPA characterizes Oil and Natural Gas Industry operations in four segments: (1) Extraction and production of crude oil and natural gas (''oil and natural gas production''), (2) natural gas processing, (3) natural gas transmission & storage, and (4) natural gas distribution.[4] The U.S. EPA defines several segments in 40 CFR 98. (Per US EPA 40 CFR 98 Subpart W).

**Source Category:** Categorization of equipment based on source type generally aligned with reporting categories, such as fugitives, engines, compressors, tanks flares, pneumatics, etc. *This definition is not included in the Veritas Protocol.*

**Source Sub-Category:** Sub-groupings of source categories into more granular equipment types based on similar operating characteristics, such as low-bleed pneumatic instruments and pneumatic pumps within the pneumatic source category. *This definition is not included in the Veritas Protocol.*

**Source-Level Emissions:** Emissions from a vent, leak or release from a discrete individual emission source. The bottom-up inventory is composed of the summation of source-level emissions. Some measurement approaches are capable of measuring source-level emissions. *See also Bottom-Up Inventory*.

**Top-Down Measurements:** Methane measurements taken at spatial scales greater than the component scale. Typical top-down measurement scales include facility, region, and production basin.[2] For example, Veritas focuses on facility-level measurements, which are net emissions from a spatially distinct set of equipment, such as a well pad, a compressor station, or a central processing facility. Top-down measurements may include continuous monitoring systems (CMS) that provide continuous or semi-continuous quantitative measurements of mass emissions of methane and linear assets such as pipelines, when a pipeline route is examined.

**Use:** In the context of Veritas protocols, to incorporate or base parts of a standard into practice.

**Value Chain (for natural gas, or supply chain):** The value chain encompasses the physical assets that allow natural gas from upstream to be gathered, treated, processed, and compressed for transportation to end-users. The value chain includes the segments upstream (production, gathering & boosting, processing), midstream (transmission & storage, LNG import/export), and distribution.

**Work Practice:** Describes how a technology is used to collect information about emissions. It should include operating procedures (e.g., distance from source, measurement time) and any restrictions on use (e.g., environmental envelopes, production segments).[2]

# Acronyms

| | |
|---|---|
| EED | Expected Emissions Distribution |
| EPA | Environment Protection Agency |
| EU ETS | EU Emissions Trading System |
| G&B | Gathering & Boosting |
| ISO | International Organization for Standardization |
| LNG | Liquefied Natural Gas |
| MDL | Minimum Detection Limit |
| MII | Measurement Informed Inventory |
| OGMP 2.0 | Oil and Gas Methane Partnership 2.0 |
| POD | Probability of Detection |
| SECR | Streamlined Energy and Carbon Reporting |
| T&S | Transmission & Storage |
| UNEP | United Nations Environment Programme |

# 1 Overview

The aim of this document is to ensure companies effectively implement and adopt the Veritas protocols. If a company chooses, this document also provides a methodology for assurance activities. Although a third-party audit is not required, it is recommended.

The scope of this protocol is contained to the documentation and recordkeeping of the Measurement and Reconciliation Protocol and Methane Emissions Intensity Protocol for facilities claiming adoption of Veritas. The Supply Chain Intensity Protocol is also included for companies that choose to adopt it to estimate their total supply chain emissions intensity across multiple segments. Although the adoption of the Veritas initiative is optional, if a company decides to adopt it fully, they shall ensure that the Assurance Protocol is followed.

# 2 Minimum Requirements

The following table outlines the minimum requirements from Veritas Measurement and Reconciliation Protocols for Pathways 1, 2, and 3. Pathway 1 is the Measurement-Only pathway, Pathway 2 is the Hybrid pathway, and Pathway 3 is the Source-Level OGMP 2.0 aligned pathway. More detailed requirements are presented in Appendix A: Checklist for Auditors.

| Key Requirements | Measurement-Only Pathway | Hybrid-Pathway | Source-Level Pathway |
|---|---|---|---|
| Establish Initial Inventory | Based on regulatory requirements | Based on regulatory requirements | Based on regulatory requirements (minimum OGMP 2.0 Level 3) |
| Conduct a Materiality Assessment | Not required | Not required | Required |
| Categorization of Best Measured vs Best Calculated | Not required | Required | Required |
| Stratification of Emissions Source Categories | Not required | Required | Required |
| Expected Emissions Distribution (EED) | Required, optional year 1 | Required, optional year 1 | Required for each material source category, optional year 1 |
| Source-Level Measurement Coverage | Not required | Not required | 90% coverage, with representative sampling based on materiality |
| Top-Down Measurement Coverage | 100% coverage of assets in defined scope | 100% coverage of assets in defined scope | Representative sampling coverage based on materiality of assets in defined scope |

| Key Requirements | Measurement-Only Pathway | Hybrid-Pathway | Source-Level Pathway |
|---|---|---|---|
| Top-Down Measurement Capture Rate | 90% capture rate | 50% capture rate | Representative Sample Size for extrapolation |
| Top-Down Measurement Source Attribution | Not required | Required | Required |
| Evaluation of Uncertainty | Optional, top-down | Optional, top-down | Required, top-down and source-level |
| Extrapolation of Measurements | Temporal only, for distribution only | Temporal only, for distribution only | Spatial and temporal |
| Reconciliation Pathway | Measurement-only method, where the inventory is primarily top-down measurements | Hybrid method, where Best Measured and Best Calculated sources are selected | Comparative method, where the top-down validates the bottom-up for comparison |
| Final Measurement Informed Inventory (MII) | Based on site-level measurements (>90%) | Based on a hybrid of site-level measurements and source-level calculations (>50%) | Based on source-level estimates aligned with OGMP 2.0 Level 4 (direct measurement, detailed engineering calculations, or simulation modelling) |
| Public Facing report | Required | Required | Required, if not an OGMP 2.0 member and reporting to UNEP |

# 3 Summary of Steps

This section outlines a summary of steps as presented in the Veritas protocols. Details on requirements for each step are noted within each of the Measurement and Reconciliation Protocols.

## 3.1 Site-Level Protocols

### 3.1.1 Measurement Steps

1) Define Scope and Identify Emission Sources
2) Categorize and Stratify Emission Sources
3) Establish Initial Inventory and Expected Emissions Distribution (EED)
4) Develop Sampling and Measurement Strategies
5) Deploy Technologies and Collect Data

### 3.1.2 Reconciliation Steps

6) Analyze Data and Evaluate Quality
7) Selection Reconciliation Pathway and Perform Cause Analysis

8) Reconcile Inventories and Estimate Measurement Informed Inventory (MII)
9) Evaluate Objectives
10) Develop Report

## 3.2 Source-Level Protocols

### 3.2.1 Measurement Steps

1) Establish Initial Inventory and Materiality Analysis
2) Step varies by segment
    a. Upstream & Midstream - Categorize and Stratify Emission Sources
    b. Distribution – Categorize and Stratify Emissions Sources and Develop Expected Emissions Distribution (EED)
3) Develop Source-Level Sampling and Measurement Strategies
4) Develop Site-Level Sampling and Measurement Strategies
5) Deploy Technologies and Collect Data

### 3.2.2 Reconciliation Steps

6) Analyze Data and Evaluate Quality
7) Evaluate Discrepancies
8) Reconcile Inventories and Estimate Measurement Informed Inventory (MII)
9) Evaluate Objectives
10) Develop Report

# 4 How to use this Protocol

Companies stating the implementation, use, adoption, conformance, or following of the Veritas protocols shall use this protocol to understand the criteria necessary for assuring Veritas. This includes the documentation, reporting, and record-keeping requirements for audit and assurance purposes. Refer to the Veritas Report Template if guidance is needed with report writing.

Assurance providers shall use this protocol to verify statements by companies on the adoption or conformance to the Veritas protocols.

Where the document states must, or shall, it acts as a requirement for adoption of the protocol. Where the document states could, or should, it acts as a recommendation. Although an audit is not mandatory, the audit section shall also be followed if a company decides to implement audit-level assurance of this protocol. The Assurance Protocol provides additional instructions on quantifying methane emission intensities for greenhouse gas inventories standards, like ISO 14064, while setting scope boundaries for audit protocols by companies.

# 5 Veritas Protocols

The goal of Veritas is to provide a standardized, technology-neutral, open-source methodology to guide the industry on how to measure and calculate accurate methane emissions. Veritas provides specific technical protocols that are technology agnostic for each segment of the natural gas industry to measure methane emissions in a consistent, credible, and comparable way. The framework includes several sequential documents that address different aspects of this goal:

- Measurement and Reconciliation Protocol (Site-Level and Source-Level)
- Methane Emissions Intensity Protocol
- Supply Chain Intensity Protocol
- Assurance Protocol (this document)

Oil and natural gas companies across the value chain may adopt Veritas independently or utilize the protocols in conjunction with other emission measurement and reduction techniques and certifications. Additionally, regulators, investors, or other organizations may adopt the Veritas protocols.

# 6 Role of GTI Energy

As custodians of the Veritas protocols, GTI Energy is responsible for updating the protocols and maintaining public access to the protocols. GTI Energy also commits to maintaining the same transparent, multi-stakeholder development process with which the initial protocols were developed.

No documentation is sent back to GTI Energy to adopt Veritas, but assistance is available for companies implementing the Veritas protocols upon request. GTI Energy plans to offer training for practitioners that seek to implement Veritas, auditors to provide third-party audits, assurance services to companies implementing Veritas, or other interested bodies such as governments or regulators. This training would be recommended, not mandated, and would cover the technical competence and understanding required to successfully implement the assurance best practices outlined in this protocol.

# 7 Criteria for Veritas Adoption by Companies

## 7.1 Criteria for Adopting Veritas

Veritas can be adopted by any segment of the value chain, either production, gathering & boosting (G&B), processing, transmission & storage (T&S), distribution, or LNG. It can also be adopted broadly across the value chain. The criteria for adopting Veritas are as follows:

1) A company must follow the Measurement and Reconciliation Protocol of a segment in order to adopt Veritas.
2) A company must, at minimum, have an internal assurance process in place to assure the Veritas implementation, or follow any audit requirements by certification schemes.
3) The assurance provider must demonstrate independence. For example: Assurance activities are to be performed by individuals other than those who perform or supervise the performance of the activities being assured. The assurance provider should not allow production and cost considerations to influence the conduct of their assurance activities.
4) Third-party auditing is encouraged. As part of the internal assurance process, the auditors must be independent of operational business units implementing Veritas, and not allow production and cost considerations to influence the conduct of their audit activities. If using a third-party auditor, all data regarding quantification, assumptions, and calculations must be made available, in the same way it would have been with an internal assurance process.
5) As per the Measurement and Reconciliation Protocols, a public-facing report or dashboard shall be published annually. The level of detail required in the report depends on whether a company has performed a third-party audit or adhered to the minimum internal assurance. If a company is an OGMP 2.0 signatory, a public disclosure report is **not required** if reporting to UNEP.
6) The Veritas report should be transparent, including sufficient documentation to demonstrate that the Measurement and Reconciliation Protocol was followed.

# 8 Capacity and Competency

## 8.1 Implementation

The company implementing Veritas should demonstrate their capacity and competency (either internally or via consulting contractors) for implementing the protocol including:

1) Background experience in oil and gas emissions detection and management including field operations
2) Demonstrated understanding of the Veritas protocols
3) Understanding of emissions inventory and emissions reporting
4) Knowledge of emissions detection and quantification technologies and their limitations
5) Experience in developing and performing emissions management and assessment programs including evaluation of the magnitude of emissions through the use of quantification technology
6) Understanding of reconciliation between emission factors and application of direct data from observed emissions events by advanced measurement technologies
7) Understanding of the Veritas framework and the various protocols for the value chain segment being assured

## 8.2 Assurance

If assurance is being provided, the assurance (internal or third-party) must be completed by a practitioner who has experience performing audit and assurance activities, including one or more of the following:

1) Background experience in oil and gas with preference for experience in emissions detection and management, including field operations
2) Ability to use analytical skills and professional judgment
3) Experience performing audits or assurance activities
4) Follows the standards of professional ethics as per their professional association, e.g., Code of Ethics, National Society of Professional Engineers[5]
5) Experience with verification or validation, e.g., ISO 14064, California AB-32, SECR (UK), EU ETS, general internal assurance

Recommended additional qualities for assurance competencies should include:

1) Experience implementing management systems
2) Understanding of emissions quantification and emissions inventories
3) Statistical analysis experience in oil and gas settings, experience handling heavy-tailed distributions
4) Understanding of Veritas Protocols

# 9 Public Disclosure Requirements

Companies stating implementation, use, completion, following, adoption, or conformance to the Veritas protocols shall publicly disclose the Measurement Informed Inventory (MII) and measurement-based methane intensity in line with the public disclosure requirements outlined in the Measurement and Reconciliation Protocol. This information should be accompanied with the acknowledgement that the methodology and principles from Veritas have been applied with sufficient detail, specifying the assets in scope and the share of these assets relative to the company's portfolio of assets. Below is an example of a statement that may be included in a company's public disclosure:

> "In YEAR (insert period of performance), we followed in detail the methodologies and principles outlined in the Veritas protocols to derive a Measurement Informed Inventory (MII) of [value] and a measurement-based methane intensity of [value] for the X and Y assets, covering Z% of the company's total portfolio."

Any material[6] modifications to the Veritas protocols also require a disclaimer for all statements on the implementation of Veritas. Information on these specific modifications must be made available to customers, auditors, certification bodies, intended users of methane intensity, and other relevant parties.

Any auditing and assurance activities of a company's implementation of the Veritas protocols should also be publicly disclosed for statements on the adoption or conformance to the Veritas protocols. Third-party auditing is not required, although it is encouraged. Should an audit identify any *material misstatements*[7] or *nonconformities*[8] from this protocol and protocols within its scope, the company must inform the recipient(s) of the material misstatement or nonconformity, then determine the most suitable *corrective action,*[9] and rectify the misstatement or nonconformity with the recipients of the methane emissions intensity in a timely manner.

A company must perform, at minimum, internal assurance provided that the reviewer demonstrates independence. Third-party auditing is not required, though the public-facing disclosure requirements will vary with and without a third-party audit.

## 9.1 With a Third-Party Audit

If a company performed a third-party audit and wishes to make a public declaration of implementing the Veritas protocols, the company must publish a public-facing report with the following components at a minimum:

- Final measurement-informed inventory (MII).
- Final measurement-informed methane emissions intensity.
- A description of the operating segment, scope of assets covered, and the reporting period, where:
    - A signed statement *must* be included confirming that the scope of the assets covered was identified through a rigorous process and confirms that 100% of the assets in the defined scope were surveyed (extrapolation is only allowed in the distribution segment).
    - Also include, to the best of the user's knowledge, the percentage of total known assets included in the scope of Veritas implementation.
- Statement of the Veritas protocol used (upstream, midstream, and/or distribution) and reconciliation pathway used.
- Definitions of any known deficiencies in the measurement-based inventory.
- Percentage of total methane emissions based on measurement, if following the Pathway 2 Site-Level protocol.
- The percentage of sources reported at Level 4, if following the Pathway 3 Source-Level protocol.
- The percentage of sites covered by site-level measurements, if following the Pathway 3 Source-Level protocol.

- A statement of the company's goals and timelines to achieve the minimum 50% of total methane emissions based on measurement, if not achieved, and following the Pathway 2 Site-Level protocol.
- A statement of the company's goals and timelines to achieve the minimum 90% of sources reported at Level 4, if not achieved, and following the Pathway 3 Source-Level protocol.
- Confirmation that external assurance was completed, including the name of the third-party auditor.
    - The verification report itself is for the company's information and is not required to be included in the public disclosure.

Other recommended fields to be included in the public-facing report:

- The uncertainty in the estimated MII and methane emissions intensities. Refer to the Veritas Uncertainty Guidance for more information on how to estimate uncertainty.
- Asset (or system) region and location details are optional, though detailed records *must* be maintained internally and made available to an auditor if needed.

## 9.2 Without a Third-Party Audit

If a company performed internal assurance activities and no third-party audit, the company must publish a public-facing report if they wish to make a public declaration of adhering to the Veritas protocols. The report must include the following components at a minimum:

- Final measurement-informed inventory (MII).
- Final measurement-informed methane emissions intensity.
- Adjustments made to the measured data during reconciliation.
- Description of the emission sources put in the Best Measured and Best Calculated categories.
- A description of the operating segment, scope of assets covered, and the reporting period, where:
    - A signed statement *must* be included confirming that the scope of the assets covered was identified through a rigorous process and confirms that 100% of the assets in the defined scope were surveyed (extrapolation is only allowed in the distribution segment).
    - Also include, to the best of the user's knowledge, the percentage of total known assets included in the scope of Veritas implementation.
- Measurement technology(ies) used, frequency deployed, asset coverage by measurement, and referenced detection limit(s).

- Statement of the Veritas protocol used (upstream, midstream, and/or distribution) and reconciliation pathway selected for use (measurement-only, hybrid, or source-level pathway) under that protocol.
- Reconciled emissions estimate for assets with emissions added or subtracted based on Veritas reconciliation noted.
- Description of the emission sources put in the Best Measured and Best Calculated categories.
- The percentage of total methane emissions based on measurement, if following the Pathway 2 Site-Level protocol.
- The percentage of sources reported at Level 4, if following the Pathway 3 Source-Level protocol.
- The percentage of sites covered by site-level measurements, if following the Pathway 3 Source-Level protocol.
- A statement of the company's goals and timelines to achieve the minimum 50% of total methane emissions based on measurement, if not achieved, and following the Pathway 2 Site-Level protocol.
- A statement of the company's goals and timelines to achieve the minimum 90% of sources reported at Level 4, if not achieved, and following the Pathway 3 Source-Level protocol.
- Definitions of any known deficiencies in measurement-based inventory.
- Comparison of the measurement-based inventory to an initial inventory and explanation of the discrepancies. For example, note any measured sources that are not part of the bottom-up inventory and note any mitigation or reduction efforts implemented during the period that are not reflected in the bottom-up inventory. This initial inventory can either be an existing, reported, bottom-up inventory; a previous, verified measurement-based inventory; or an inventory estimated using the results of published research.
- Explanations (as much as possible) for year-to-year differences in the (net) measurement-based inventory result.
- Statement confirming assurance was completed internally by personnel that were not involved in the execution of protocols.

Other recommended fields to be included in the public-facing report:

- The uncertainty in the estimated MII and methane emissions intensities. Refer to the Veritas Uncertainty Guidance for more information on how to estimate uncertainty.
- Asset (or system) region and location details are optional, though detailed records *must* be maintained internally and made available to an auditor if needed.

Please see the Measurement and Reconciliation Protocols for each individual segment for more information.

### 9.3 OGMP 2.0 Signatories

If a company is an OGMP 2.0 signatory, a public-facing report is encouraged, but not required, as members report directly to UNEP for review.

## 10 Documentation and Record Keeping Requirements

Below are the documentation and record keeping requirements to implement Veritas, in addition to public reporting requirements. The following items must be kept as internal records and made available to an auditor, as requested, but are not required to be disclosed publicly.

1) Standard operating procedures for applying Veritas methodology must be documented, including:
    a. Training of personnel, if completed
    b. Data collection technologies
    c. Data collection and quality assurance procedures
    d. Software systems utilized
    e. Data retention plans
    f. Internal assurance processes, including findings
    g. Third-party audit, if completed, including findings
2) As required by the Measurement and Reconciliation Protocol, an annual report must be developed.
    a. If deviations from the prescribed methodology in each of the protocols are identified, justification must be provided, and a re-statement of the report may be required if the deviation is deemed to have a material impact on results and/or the justification is not deemed acceptable.
3) Records retention procedures.
4) Detailed information of the assets included in the scope of the Veritas implementation must be documented and made available to an auditor.
5) Additional documentation requirements are outlined within the individual protocols.

# 11 Activities for Assurance Providers

## 11.1 Assurance

This section provides an overview of how assurance providers shall assure the implementation of Veritas. Assurance providers can utilize methodologies such as the "Standard for validation, verification, and audit".[10]

For assurance of Veritas, the following shall occur:

- Development of a verification plan with steps to follow for conducting the internal or external assurance process
- Confirmation of documentation of steps to follow an internal or external assurance process
- Review of competency assessments of those implementing Veritas, e.g., do the implementors have domain knowledge in methane measurement and quantification approaches?
- Review of past assurance activities related to Veritas
- Review of data systems, responsibilities, quality assurance, and oversight
- Confirmation of record and retention procedures
- Documentation of activities conducted and assurance findings, including a list of applicable nonconformities to the protocols

## 11.2 Auditing

Although a third-party audit is not required, it is recommended. If an audit occurs, below are the requirements:

- Third-party audit must ensure that the Veritas protocols were followed
- Third-party auditors must have domain knowledge in audit and assurance practices, e.g., ISO 14064, California AB-32, SECR (UK), EU ETS
- The audit must have a process for identifying and closing findings
- Audit must have a process to verify the Measurement and Reconciliation Protocol, Methane Emissions Intensity Protocol, and, if adopted, the Supply Chain Intensity Protocol
- Third-party auditors must develop a verification plan prior to starting the audit activities, and the plan must include the following key sections:
    - Scope and objectives
    - Boundary
    - Materiality threshold

    - Sampling plan for evidence gathering
    - List of activities and schedules to be undertaken
    - Procedures for identifying and closing findings
    - Procedures for verifying the Measurement and Reconciliation Protocol, Methane Emissions Intensity Protocol, and, if adopted, the Supply Chain Intensity Protocol

- Third-party auditors must communicate the verification plan to the company prior to starting the audit activities
- The audit must be conducted according to the verification plan, although the verification plan may be revised during the audit process as necessary
- Third-party auditors must issue to the company a verification report, for internal record keeping, that includes the following as a minimum:

    - Appropriate title
    - Name of responsible party to which the verification report is being presented
    - Verification plan
    - Key Findings, including material misstatements and nonconformities to the protocols, as well as corrective actions performed with associated dates and names of responsible parties
    - A statement describing the auditor's definitive opinion on whether the company conformed to the Veritas protocols or not

If the third-party auditor is unable to arrive at a definitive opinion due to insufficiency of information gathered during the audit process, the verification report must state so.

In cases where multiple solutions or options are involved, the third-party auditor must apply judgment using the conservativeness principle in which the most cautiously moderate approach should be selected. This case may apply when a deviation from the protocols was implemented, in which case the third-party auditor must provide a positive opinion only if the deviation is the most cautiously moderate option among all possible choices based on the justification provided.

Documentation of a positive opinion through a verification report is considered confirmation that the protocols were adhered to.

# 12 Assessment Guidelines for Assurance Providers

Note: All criteria below are specified in each Veritas protocol and are listed explicitly for convenience.

## 12.1 Assessment of Veritas Measurement and Reconciliation Protocol Requirements

When assessing the implementation of the methodology outlined in the measurement steps of the protocol, the following criteria should be reviewed for accuracy, consistency, transparency, and completeness for each relevant segment of the natural gas value chain:

1) Scope of assets and characterization of facilities
2) Top-down measurements per measurement protocol
3) Measurement method options identified, measurement method option selected, measurement technology operating conditions, and methane emissions measurements taken
4) Data sources for expected distribution of emissions (e.g., previous measurement campaigns, past regional studies, other assumptions)
5) Sampling strategy, including frequency and sampling size
6) Field deployment strategies and approaches, e.g., interviews, observations, documentation review

When assessing the implementation of the methodology outlined in the reconciliation steps of the protocol, the following criteria should be reviewed for accuracy, consistency, transparency, and completeness:

1) Bottom-up inventory confirmation
2) Review of measurements detected with source and identification of inclusion in the bottom-up inventory, acceptance or rejection of data and reason, and cause analysis conclusions
3) Methane intensity calculation
4) Allocations to products
5) Reconciliation report
6) Application of tests
7) Documentation and record keeping processes

## 12.2 Assessment of Veritas Methane Emissions Intensity Protocol Requirements

When assessing the implementation of the methodology outlined in the Veritas Methane Emissions Intensity Protocol, the following criteria should be reviewed for accuracy, consistency, transparency, and completeness:

1) Calculation methodology
2) Allocation to products
3) Final emissions intensity

# 13 FAQs

**Who can claim or declare compliance with the Veritas protocols?**

Only operators of oil and natural gas companies can declare compliance with the Veritas protocols. Service providers or measurement technology companies cannot claim adherence to the protocols, as the protocols are specifically for deriving MIIs and measurement-based methane intensities, from performing measurements and reconciliation to undergoing audits and assurance, and publicly disclosing the results.

**Can an oil and gas company be Veritas-certified?**

No. Veritas is not a certification program, and GTI Energy is not a certification body that stamps or issues certifications. The protocols are a set of standardized methodologies to aid companies in developing measurement-based inventories and methane intensities and to provide guidance for obtaining other certifications.

**What are the valid action words to describe usage of the Veritas protocols?**

Valid verbs include the following:

- Adhere to
- Adopt
- Implement
- Follow
- Use
- Abide by
- Observe
- Conform to/with
- Meet the requirements of

The phrases "certified by GTI Energy-Veritas" or "Veritas-certified" are **not** valid declarations, as Veritas is not a certification program and GTI Energy does not award certifications to companies that follow the Veritas protocols.

**Can the Veritas Protocols be used to gain certifications?**

Yes, the Veritas protocols can be followed to gain certifications from other certification initiatives and programs. However, the final discretion of certification lies with the respective initiatives and programs. Veritas protocols are 'how to' guides that can help achieve various certifications but cannot guarantee approval from those agencies.

# 14 Appendix A: Checklists for Auditors

*Table 1. Pathway 1 and 2 (Site-Level) Minimum Requirements for Assurance Review*

| Step | Item | Optional vs Required |
|---|---|---|
| Define Scope and Identify Emission Sources | Specify which assets and associated sources are covered by the implementation | Required |
| | Must not extrapolate emissions estimates from surveyed assets to non-surveyed assets in upstream and midstream (allowed in distribution) | Required |
| Categorize and Stratify Emission Sources | Categorize sources into Best Measured vs Best Calculated | Required |
| | Justification for Best Measured vs Best Calculated | Highly recommended |
| | Confirm any changes to Best Measured vs Best Calculated after measurement | Highly recommended |
| | Stratify assets and sources or groups of assets and sources based on features for similar characteristics | Highly recommended |
| Establish Initial Inventory and Expected Emissions Distribution (EED) | Develop initial total annual emissions inventory | Required |
| | Confirm methodology that is the basis for the initial emissions inventory | Required |
| | Develop expected emissions distribution | Optional for year 1 |
| | Provide and document the rationale for the data or model used to develop EEDs | Optional for year 1 |
| | Confirm production region or sub-region used in the EED | Optional for year 1 |
| | Confirm types of facilities being assessed in the EED | Optional for year 1 |
| | Confirm the mode of operation of facilities in the EED | Optional for year 1 |
| | If using the EED exception, a statement affirming that this is the first implementation of Veritas. | Optional for year 1 |
| Develop Sampling and Measurement Strategies | Review and establish objectives: Confirmation that 100% of facilities and linear assets in the identified scope are surveyed | Required |
| | Review and establish objectives: Confirmation that at least 50% of the resulting MII is attributable to measurement | Required |

| Step | Item | Optional vs Required |
|---|---|---|
| | Identification of technologies: required to deploy at least one technology that can complete whole facility measurements | Required |
| | Identification of technologies: established POD performance metrics | Recommended |
| | Identification of technologies: established localization attribution capabilities | Recommended |
| | Identification of technologies: established rate quantification performance and uncertainty | Recommended |
| | Select measurement method: requires full facility coverage and expected to detect >90% of expected emissions | Required for measurement-only pathway |
| | Select measurement method: supports cause analysis and equipment attribution | Required for hybrid pathway |
| | Select measurement method: confirmation of detection capability based on EED (e.g., 5kg/hr, 90% of the time) | Required |
| | Establish survey plan: confirm plan for temporal frequency and spatial coverage | Required |
| | Document measurement and sampling strategy, including rationale for objectives and selections | Required |
| Deploy Technologies and Collect Data | Measurement data collected | Required |
| | Non-measurement data used in the MII (as applicable) | Required, as applicable |
| | Documentation of any deviation from the sampling plan and justification | Required, as applicable |
| Analyze Data and Evaluate Quality | Documented measurement and non-measurement data | Required |
| | Documented process for quality assurance on the data | Required |
| | Summary of emissions data, including number of sites with detections, number of detections collected, histogram of emissions rates | Required |
| Selection Reconciliation Pathway and Perform Cause Analysis | Reconciliation Pathway Selected (1 - Measurement-only, or 2- Hybrid) | Required: Site-Level Protocol |
| | Confirmation that technology collected >90% of expected emissions | Required: Measurement Only |
| | Confirmation that the technology supports attribution of emissions to sources | Required: Hybrid |

| Step | Item | Optional vs Required |
|---|---|---|
| | Documentation of cause analysis or source attribution for detected emissions and number of detected emissions investigated | Required: Hybrid |
| Reconcile Inventories and Estimate Measurement Informed Inventory (MII) | Equation for using the hybrid MII is implemented, where MII = ERb + ERc + ERm or measurement-only where MII = ERm | Required |
| | Uncertainty is estimated for the MII | Highly recommended |
| Evaluate Objectives | Validate objective of 100% survey coverage | Required |
| | Validate objective of 50% of the MII is based on measurements | Required |
| | A statement of where objectives were not achieved and improvements to future sampling | Required, as applicable |
| Develop Report | Veritas report template is completed | Required: without 3rd party audit |
| | Statement is included for which protocol is used (upstream, midstream, downstream) | Required |
| | Description of the operating segment, scope of assets, and reporting period is included | Required |
| | A statement of the measurement technologies and sampling plan (frequency, spatial coverage, and detection capabilities (MDL)) | Required |
| | Description of Best Measured vs Best Calculated sources | Required |
| | The MII and methane intensity are reported | Required |
| | Results of objectives for 100% sampling coverage and 50% MII coverage | Required |
| | Confirmation of a public-facing report | Required |

*Table 2. Pathway 3 (Source-Level) Minimum Requirements for Assurance Review*

| Step | Item | Optional vs Required |
|---|---|---|
| Establish Initial Inventory and Materiality Analysis | Inventory is developed into source categories | Required |
| | Methodology for initial inventory is confirmed at Level 3 | Required |
| | Determine at least 95% of assets are in scope | Required for OGMP signatories |
| | Determine at least 90% of emissions within each asset are in scope | Required |
| | Minimum 70% of sources are in scope for MII, with justification for 90% not being met | As applicable, if 90% threshold cannot be met |
| Categorize and Stratify Emission Sources | Source sub-categories are developed and justified | Required |
| Develop Source-Level Sampling and Measurement Strategies | Determination of Best Measured vs Best Calculated sources | Required |
| | Minimum representative sampling coverage requirements for each source category are met (based on materiality) | Required |
| | EED for material source categories | Required |
| Develop Site-Level Sampling and Measurement Strategies | Minimum representative sampling coverage for each material asset | Required |
| | Identification and justification of chosen technology, ensuring the technologies are distinct for source-level and site-level measurements | Required |
| Deploy Technologies and Collect Data | Collection of measurement data, and documentation of operational activities and/or anomalies presented | Required |
| | Determination of cause analysis | If possible |
| Analyze Data and Evaluate Quality | Extrapolation of measurements | Required |
| | Rationale for removal or amending of anomaly data | Required, as applicable |
| | Produce source-level and site-level inventories for comparison | Required |

| Step | Item | Optional vs Required |
|---|---|---|
| | Evaluation of uncertainty in both bottom-up and top-down | Required |
| Evaluate Discrepancies | Method for comparing discrepancies, confirming granularity at which the comparison was performed | Required |
| | Convert measurements and estimates into common units for comparison | Required |
| | Assessment of confidence intervals | Required |
| | Evaluate discrepancies for reconciliation | Required |
| | Investigate large discrepancies | Required |
| | Determine reason/source of discrepancies | If possible |
| Reconcile Inventories and Estimate Measurement Informed Inventory (MII) | Estimate measurement-informed inventory | Required |
| | Confirm where adjustments were made, and underlying assumptions | Required, as applicable |
| Evaluate Objectives | Confirmation that objectives were met (90% MII source-level inventory) | Required |
| | Re-evaluation of materiality | Required, as applicable |
| | Evaluation of improvements to future efforts | Required |
| Develop Report | Develop a public facing report | Required if not an OGMP signatory |
| | Statement confirming use of the source-level pathway | Required if not an OGMP signatory |
| | Description of operating segment and reporting period | Required if not an OGMP signatory |
| | A statement of the measurement technology(ies) used, frequency deployed, asset coverage by measurement, and a reference to documented technology capabilities, | Required if not an OGMP signatory |
| | Description of the emission sources put in the Best Measured and Best Calculated categories | Required if not an OGMP signatory |
| | Resulting MII | Required if not an OGMP signatory |
| | Evaluation of objectives | Required if not an OGMP signatory |

# 15 References

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3. ONE Future Methane Emissions Estimation Protocol, Version 4 December 2021 - https://onefuture.us/wp-content/uploads/2021/12/ONE-Future-Protocol-2021.pdf
4. United States Code of Federal Regulations, 86 Fed Reg 63113
5. Code of Ethics | National Society of Professional Engineers (nspe.org)
6. ISO 14064-3:2019, 3.6.9 - Greenhouse gases — Part 3: Specification with guidance for the verification and validation of greenhouse gas statements - Materiality
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