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Greenhouse gases — Competence requirements for greenhouse gas validation teams and verification teams

Gaz à effet de serre — Exigences de compétence pour les équipes de validation et les équipes de vérification de gaz à effet de serre

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14066 was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 7, *Greenhouse gas management and related activities*.

Introduction

This International Standard specifies competence requirements for validation teams and verification teams for the benefit of greenhouse gas (GHG) programme administrators, regulators, validation bodies and verification bodies. To achieve consistency in the international marketplace and maintain public confidence in GHG reporting and other communications, there is a need to define competence requirements for validation teams and verification teams.

Requirements for GHG validation bodies and GHG verification bodies are established in ISO 14065. ISO 14065 requires that validation bodies and verification bodies establish and maintain a procedure to manage the competence of its personnel undertaking the various validation or verification activities within the team appointed for the engagement. It is the role of the validation or verification body to ensure that teams have the necessary competence to effectively complete the validation or verification process. This International Standard includes principles for ensuring competence of validation teams and verification teams. Supporting these principles are general requirements based on the tasks that validation teams or verification teams need to be able to perform and the competence required to do so.

This International Standard can be used in conjunction with ISO 14065 as the basis for assessing and recognizing the competence of validation teams and verification teams.

Users of this International Standard are encouraged to refer to ISO 14064-1 and ISO 14064-2 for GHG quantification and reporting and to ISO 14064-3 for GHG validation and verification.

Figure 1 shows the relationships between the application of this International Standard and ISO 14064-1, ISO 14064-2, ISO 14064-3 and ISO 14065.

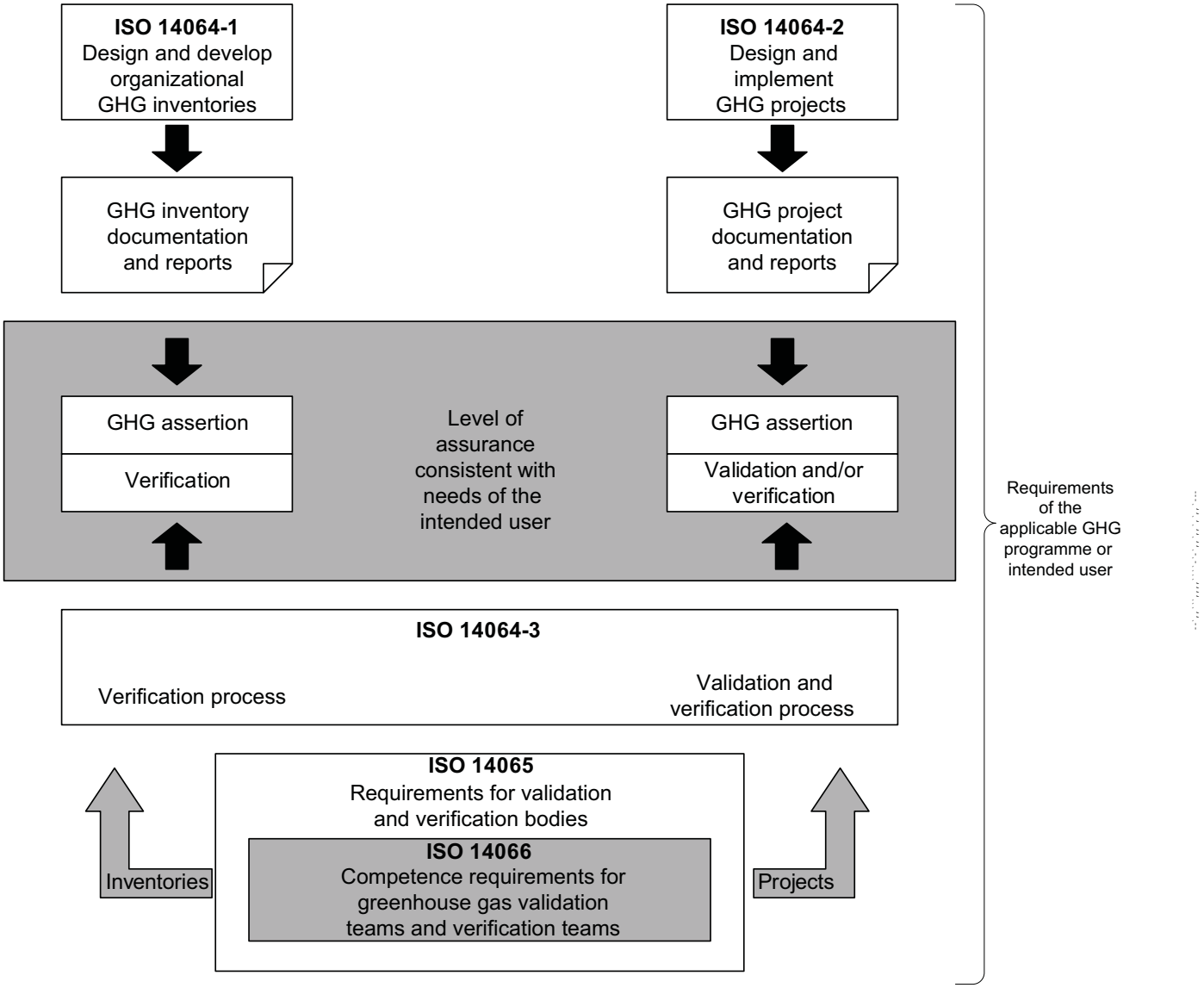

Figure 1 — Framework for using ISO 14066 with ISO 14064-1, ISO 14064-2, ISO 14064-3 and ISO 14065

Greenhouse gases — Competence requirements for greenhouse gas validation teams and verification teams

1 Scope

This International Standard specifies competence requirements for validation teams and verification teams. This International Standard complements the implementation of ISO 14065.

This International Standard is not linked to any particular greenhouse gas (GHG) programme. If a particular GHG programme is applicable, competence requirements of that GHG programme are additional to the requirements of this International Standard.

NOTE Requirements for the management and support of personnel competence are specified in ISO 14065:2007, Clause 6.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14064-3:2006, *Greenhouse gases — Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*

ISO 14065:2007, *Greenhouse gases — Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Terms specific to competence requirements

3.1.1
sector
technical area sharing common attributes and similar GHG sources, sinks and reservoirs

NOTE The abbreviated term SSRs is used to define sources, sinks and reservoirs.

3.1.2
team leader
person who manages the validation team or verification team

3.1.3
professional scepticism
attitude that includes a questioning mind and a critical assessment of evidence

NOTE Taken from International Framework for Assurance Engagements[16], paragraph 40.

3.1.4
competence
ability to apply knowledge and skills to achieve intended results

NOTE 1 Ability implies exhibiting appropriate personal behaviour when conducting the validation or verification.

NOTE 2 Adapted from ISO 19011:—, definition 3.14.

NOTE 3 When defining competence, the following meanings have been applied to the words used:

— knowledge refers to facts and methods, i.e. to know;

— skills means to carry out in practice, i.e. to do.

NOTE 4 This International Standard uses the term “competence” instead of “competency”. The meanings of the terms are differentiated as follows:

— competence is defined as the broad range of knowledge, skills, attitudes and observable behaviour that together comprise the ability to deliver a specified professional service; it also involves adoption of a professional approach that values accountability to the public and leadership in professional practice, the public sector, the corporate sector and education;

— competency is defined as the particular tasks that competent personnel perform while applying, or bringing to bear, the pervasive qualities and skills that are characteristic of competent personnel to the level of proficiency defined as appropriate by the profession.

3.1.5
test
audit technique used to assess a characteristic of items in a sampled population of GHG data and information against validation or verification criteria

NOTE 1 See ISO 14064-3:2006, 4.7.

NOTE 2 Characteristics can include accuracy, completeness, functionality, knowledge, quality and veracity.

3.2 Terms related to greenhouse gases

3.2.1
greenhouse gas
GHG
gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds

NOTE GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

[ISO 14064-3:2006, definition 2.1]

3.2.2
greenhouse gas assertion
factual and objective declaration made by the responsible party

NOTE 1 The GHG assertion could be presented at a point in time or could cover a period of time.

NOTE 2 The GHG assertion provided by the responsible party should be clearly identifiable and capable of consistent evaluation or measurement against suitable criteria by a validator or verifier.

NOTE 3 The GHG assertion could be provided in the form of a GHG report or GHG project plan.

NOTE 4 Adapted from ISO 14064-3:2006, definition 2.11.

3.2.3
greenhouse gas information system
policies, processes and procedures to establish, manage and maintain GHG information

[ISO 14064-3:2006, definition 2.12]

3.2.4
greenhouse gas project
activity or activities that alter the conditions identified in the baseline scenario which cause greenhouse gas emission reductions or greenhouse gas removal enhancements

[ISO 14064-3:2006, definition 2.14]

3.2.5
greenhouse gas programme
voluntary or mandatory international, national or sub-national system or scheme that registers, accounts or manages GHG emissions, removals, greenhouse gas emission reductions or greenhouse gas removal enhancements outside the organization or GHG project

[ISO 14064-3:2006, definition 2.16]

3.3 Terms related to people and organizations

3.3.1
client
organization or person requesting validation or verification

NOTE The client could be the responsible party, the GHG programme administrator or other stakeholder.

[ISO 14064-3:2006, definition 2.27]

3.3.2
intended user
individual or organization identified by those reporting GHG-related information as being the one who relies on that information to make decisions

NOTE The intended user could be the client, the responsible party, GHG programme administrators, regulators, the financial community or other affected stakeholders, such as local communities, government departments or non-governmental organizations.

[ISO 14064-3:2006, definition 2.26]

3.3.3
organization
company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

[ISO 14064-3:2006, definition 2.23]

3.3.4
personnel
persons working with or on behalf of the validation or verification body

[ISO 14065:2007, definition 3.2.4]

3.3.5
responsible party
person or persons responsible for the provision of the GHG assertion and the supporting GHG information

NOTE The responsible party can be either individuals or representatives of an organization or project and can be the party who engages the validator or verifier. The validator or verifier may be engaged by the client or by other parties, such as the GHG programme administrator.

[ISO 14065:2007, 3.2.5]

3.3.6
technical expert
person who provides specific knowledge or expertise to the validation team or verification team

NOTE 1 Specific knowledge or expertise is that which relates to the organization, the project to be validated or verified, or language or culture.

NOTE 2 A technical expert does not act as a validator or verifier in the validation team or verification team.

NOTE 3 Adapted from ISO 19011:—, definition 3.15.

3.4 Terms related to validation and verification

3.4.1
validation
systematic, independent and documented process for the evaluation of a greenhouse gas assertion related to a GHG project plan against agreed validation criteria

NOTE 1 In some cases, such as in first-party validations, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

NOTE 2 The content of a GHG project plan is described in ISO 14064-2:2006, 5.2.

NOTE 3 Adapted from ISO 14064-3:2006, definition 2.32.

3.4.2
validator
competent and independent person or persons with responsibility for performing and reporting on the results of a validation

NOTE 1 Competence areas for validators include GHG programme, technical, data and information auditing, and project specific requirements.

NOTE 2 Adapted from ISO 14065:2007, definition 3.3.2.

3.4.3
validation statement
formal written declaration to the intended user, following validation of a GHG project plan, which provides assurance on the statements in the responsible party's GHG assertion

[ISO 14065:2007, definition 3.3.4]

3.4.4
verification statement
formal written declaration to the intended user, following verification, which provides assurance on the statements in the responsible party's GHG assertion

[ISO 14065:2007, definition 3.3.5]

3.4.5
verification
systematic, independent and documented process for the evaluation of a greenhouse gas assertion against agreed verification criteria

NOTE In some cases, such as in first-party verifications, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

[ISO 14064-3:2006, definition 2.36]

3.4.6
verifier
competent and independent person, or persons, with responsibility for performing and reporting on the verification process

NOTE 1 Competence areas for a verifier include GHG programme, technical, data and information auditing, and project specific requirements.

NOTE 2 Adapted from ISO 14065:2007, definition 3.3.8.

3.4.7
validation body
body that performs validations of GHG assertions in accordance with ISO 14064-3 and ISO 14065

NOTE 1 A validation body can be an individual.

NOTE 2 Adapted from ISO 14065:2007, definition 3.3.3.

3.4.8
verification body
body that performs verifications of GHG assertions in accordance with ISO 14064-3 and ISO 14065

NOTE 1 A verification body can be an individual.

NOTE 2 Adapted from ISO 14065:2007, definition 3.3.3.

3.4.9
validation team
one or more validators conducting a validation, supported if needed by technical experts

NOTE 1 One validator of the validation team is appointed as the validation team leader.

NOTE 2 The validation team can include validators-in-training.

NOTE 3 When the team consists of one person, that person is expected to possess all the competencies required.

NOTE 4 Adapted from ISO 14065:2007, definition 3.3.6.

3.4.10
verification team
one or more verifiers conducting a verification, supported if needed by technical experts

NOTE 1 One verifier of the verification team is appointed as the verification team leader.

NOTE 2 The verification team can include verifiers-in-training.

NOTE 3 When the team consists of one person, that person is expected to possess all the competencies required.

NOTE 4 Adapted from ISO 14065:2007, definition 3.3.6.

3.4.11
materiality
concept that individual or the aggregation of errors, omissions and misrepresentations could affect the greenhouse gas assertion and could influence the intended users' decisions

NOTE 1 The concept of materiality is used when designing the validation or verification and sampling plans to determine the type of substantive processes used to minimize risk that the validator or verifier will not detect a material discrepancy (detection risk).

NOTE 2 The concept of materiality is used to identify information that, if omitted or misstated, would significantly misrepresent a GHG assertion to intended users, thereby influencing their conclusions. Acceptable materiality is determined by the validator, verifier or GHG programme based on the agreed level of assurance.

[ISO 14064-3:2006, definition 2.29]

4 Principles

4.1 General

The application of principles is fundamental to the evaluation of team members' competence to carry out validation and verification. Principles are the basis for, and will guide the application of, requirements in this International Standard.

4.2 Independence

The principle of independence involves:

— remaining impartial to the activity being validated or verified, and free from bias and conflict of interest;

— maintaining objectivity throughout the validation or verification to ensure that the findings and conclusions will be based on objective evidence generated during the validation or verification.

4.3 Integrity

The principle of integrity involves demonstrating fair behaviour through trust, honesty, working with diligence and responsibility, observing the law, maintaining confidentiality and making disclosures expected by the law and the profession throughout the validation or verification process.

4.4 Fair presentation

The principle of fair presentation involves:

— reflecting truthfully and accurately validation or verification activities, findings, conclusions and reports;

— reporting significant obstacles encountered during the validation or verification process, as well as unresolved, diverging opinions among team members, the responsible party and the client.

4.5 Due professional care

The principle of due professional care involves:

— exercising due care and judgement in accordance with the risk attributed to the task performed and the confidence placed by clients and intended users;

— having the necessary competence to undertake the validation or verification.

4.6 Professional judgement

The principle of professional judgement involves:

— being able to draw meaningful and accurate conclusions, give opinions and make interpretations based on observations, knowledge, experience, literature and other sources of information.

— demonstrating professional scepticism.

NOTE Annex A provides guidance on evidence and the application of professional scepticism.

4.7 Evidence-based approach

Evidence is verifiable. It is based on a sampling of information. The appropriate use of sampling is closely related to the confidence that can be placed in the validation and verification conclusions.

5 Team competence

5.1 General

A validation team or a verification team collectively shall have the required **competence** (3.1.4) to perform validation or verification activities.

NOTE 1 ISO 14065:2007 sets out the competence required for the validation team or verification team in 6.3 and the process for managing competence in 6.1 and 6.2.

NOTE 2 See Clause 6. Annex C provides examples of sector competence.

5.2 Knowledge

5.2.1 General

A validation team or a verification team shall possess the following:

a) GHG programme knowledge (see ISO 14065:2007, 6.3.2),

b) technical knowledge (see Clause 6 of this International Standard and ISO 14065:2007, 6.3.3),

c) data and information auditing knowledge (see ISO 14065:2007, 6.3.4), and

d) team leader knowledge (see ISO 14065:2007, 6.3.7).

5.2.2 GHG programme knowledge

5.2.2.1 Generic GHG programme knowledge

A validation team or a verification team collectively shall have GHG programme knowledge, including the following:

a) eligibility requirements,

b) applicable legal requirements,

c) implementation in different jurisdictions as applicable,

d) restrictions associated with geographic locations,

e) validation or verification requirements and guidelines, and

f) scope of the GHG emissions subject to reporting (see ISO 14064-3:2006, A.2.3.7, for guidance on validation or verification scope).

5.2.2.2 Additional GHG programme knowledge for organization level verification

A verification team shall have additional GHG programme knowledge for organization level verification, including, as applicable, eligible processes and sectors.

5.2.2.3 Additional GHG programme knowledge for project validation or verification

A project validation team or a project verification team collectively shall have additional GHG programme knowledge for project validation or verification, including the following:

a) established project boundaries and project types, including industry sectors and technology areas,

b) applicable project methodologies, and

c) eligible emission reductions or removal enhancements.

5.2.3 Technical knowledge

5.2.3.1 Generic technical knowledge

A validation team or a verification team collectively shall have technical knowledge, including (as applicable) the following:

a) GHGs, global warming potentials, activity data and emission factors,

b) application of materiality and material discrepancy,

c) application of quantification and reporting principles (e.g. completeness, consistency, accuracy, transparency and relevance),

d) relevant **sector** (3.1.1) GHG sources, sinks and reservoirs (SSRs), and

e) relevant sector quantification methodologies, monitoring techniques and calibration procedures and their consequences for data quality.

5.2.3.2 Additional technical knowledge for organization level verification

A verification team collectively shall have additional technical knowledge for organization level verification, including (as applicable) criteria, processes, procedures and/or methodologies for setting:

a) organizational boundaries, and

b) operational boundaries.

5.2.3.3 Additional technical knowledge for project validation or verification

A project validation team or a project verification team collectively shall have additional project-specific technical knowledge including (as applicable) the following:

a) the application of the following principles and concepts:

— conservativeness,

— equivalence,

— additionality,

— leakage, and

— permanence;

b) common criteria, processes, procedures and/or methodologies for:

— selecting baselines,

— setting GHG project boundaries,

— assessing additionality (as exemplified by benchmarking and financial, technological and policy barriers), and

— the treatment of uncertainty;

c) key factors that influence the GHG emission reduction and/or removal enhancement;

d) the views of relevant stakeholders.

5.2.3.4 Additional technical knowledge for the verification of other GHG assertions

A verification team collectively shall have additional technical knowledge for the verification of other GHG assertions, including as applicable criteria, processes, procedures and/or methodologies for the following:

a) life cycle assessment for the purposes of carbon footprint declarations (see ISO 14040, ISO 14044, ISO/TR 14047, ISO/TS 14048, ISO/TR 14049 and the future ISO 14045 and ISO 14067),

b) environmental declarations and labels (see ISO 14020, ISO 14021, ISO 14024 and ISO 14025), and

c) statements of carbon neutrality and other related assertions.

5.2.4 Data and information auditing knowledge

A validation team or a verification team collectively shall have data and information auditing knowledge, including the following:

a) data and information auditing methodologies,

b) risk assessment methodologies,

c) data and information sampling techniques,

d) GHG data and information control systems, and

e) typical internal control systems.

5.2.5 Team leader knowledge

A team leader shall have sufficient validation or verification knowledge (applicable to the engagement), including the following:

a) the scope, criteria, objective, materiality and level of assurance of the validation or verification,

b) the competence of team members,

c) validation or verification of related risks, and

d) project, resource, and team management.

5.3 Skills

A validation team or a verification team collectively shall have the necessary skills to perform validation or verification activities. Examples of applicable skills include the ability to:

a) retrieve relevant information and apply the knowledge in a manner appropriate for the work,

b) understand the meaning, translation, and interpretation of information,

c) think critically and analyse multiple inputs,

d) distinguish between facts and inferences and exercise professional scepticism,

e) carry out independent research to challenge assumptions and evidence asserted by a responsible party or client,

f) strike a balance between attention to detail and a high-level assessment of the anticipated outcome during the validation or verification process,

g) manage detail, particularly at the level of ensuring that required checks are performed (e.g. between a GHG project plan and the GHG project report, and between a GHG inventory and its corresponding report),

h) evaluate the information, data, and assumptions and make professional judgements,

i) apply validation and verification methods in expected and unanticipated situations, and

j) communicate the validation or verification process and results.

NOTE Annex B outlines methods that can be used to evaluate the skills of validation team and verification team members.

6 Sector competence

A validation team or a verification team collectively shall have applicable **sector** (3.1.1) knowledge and skills. Sector knowledge is covered in 5.2.3.

NOTE 1 Annex C provides examples of sector competence.

For each sector, the validation team or verification team's collective technical competence shall include (as applicable) the capability to:

a) identify GHG SSRs from process flow diagrams, site plans, site inspections, process and instrumentation drawings, approvals and permits or other data sources,

b) identify GHG SSRs relative to the **sector** (3.1.1),

c) identify sources of leakage,

d) identify project baselines associated with a specific project type,

e) identify situations that could affect the materiality of the GHG assertion, including typical and atypical operating conditions,

f) demonstrate equivalence between the type and level of activities, goods or services of the baseline scenario and GHG project, and

g) apply industry knowledge in assessing the project and baseline scenarios.

NOTE 2 Annex B outlines methods that can be used to evaluate the sector competence and capability of validation team and verification team members.

7 Competence for the review of GHG validation or verification statements

Personnel carrying out the review of the validation or verification statement shall be competent to carry out the functions or activities set out in ISO 14065:2007, 8.5.

NOTE As long as personnel conducting a review have not participated in validation or verification activities under the direction of the team leader, they are not considered members of the validation team or verification team (even if they observed all or a portion of the validation team or verification team's activities).

8 Development and maintenance of validation and verification knowledge and skills

8.1 General

A validation team or a verification team is competent on the basis of the team's collective knowledge, skills, and abilities.

NOTE Annex D shows the relationship between the validation and verification competence requirements in ISO 14065 and the skills and abilities needed by validation teams and verification teams.

8.2 Demonstration of knowledge and skills

For the purposes of achieving initial or supplemental qualifications to undertake validation or verification activities for given sectors, a validator or verifier shall demonstrate his/her knowledge and skills through a variety of methods, including, but not limited to:

a) education,

b) training,

c) work experience relevant to the competence required for the activity, and

d) tutoring or mentoring by more experienced staff (e.g. other members of the GHG validation team or verification team).

NOTE 1 This clause is intended to encourage the development of professionals.

NOTE 2 Examples of work experience can include employment, consulting, project development or professional auditing in the technical area.

NOTE 3 Practical experience, especially in an environment in which teamwork is encouraged, helps less experienced team members to develop attitudes of professional scepticism and make sounder judgements concerning the assessment of risk and the sufficiency and appropriateness of evidence.

NOTE 4 Annex E provides examples of prerequisite entry-level awareness for individuals starting training as a team member.

NOTE 5 Annex F outlines personal behaviour for validators and verifiers.

8.3 Maintenance of knowledge and skills

A validator or a verifier should maintain knowledge and skills through ongoing awareness of developments in GHG management, including relevant national and international GHG programmes, climate science and relevant legal requirements.

A validator or a verifier should also undertake a programme of continuing professional development, including training, consistent with emerging trends in GHG management.

NOTE 1 Requirements for maintenance of team members' personnel records are given in ISO 14065:2007, 6.5.

NOTE 2 As specified in ISO 14065:2007, 6.2, team member performance (e.g. the demonstration of knowledge and skills) is periodically monitored.

NOTE 3 Annex B provides methods that can be used to evaluate the knowledge and skills of team members.

Annex A
(informative)

Evidence and the application of professional scepticism

A.1 Evidence

Members of the validation team or the verification team plan and perform a validation/verification with an attitude of professional scepticism to obtain sufficient appropriate evidence about whether the subject matter information is free of material misstatement. Members of the validation team or the verification team consider materiality, assurance engagement risk, and the quantity and quality of available evidence when planning and performing the engagement, in particular when determining the nature, timing and extent of evidence-gathering procedures.

Members of the validation team or the verification team plan and perform a validation/verification with an attitude of professional scepticism recognizing that circumstances may exist that cause the subject matter information to be materially misstated. An attitude of professional scepticism means that members of the validation team or the verification team make a critical assessment, with a questioning mind, of the validity of evidence obtained and are alert to evidence that contradicts or brings into question the reliability of documents or representations by the responsible party.

EXAMPLE An attitude of professional scepticism is necessary throughout the engagement process for members of the validation team or the verification team to reduce the risk of overlooking suspicious circumstances, of overgeneralizing when drawing conclusions from observations, and of using faulty assumptions in determining the nature, timing and extent of evidence-gathering procedures and evaluating the results thereof.

Members of the validation team or the verification team consider the reliability of the information to be used as evidence, e.g. photocopies, facsimiles, filmed, digitized or other electronic documents, including consideration of controls over their preparation and maintenance where relevant. Although members of the validation team or the verification team are not trained or expected to be experts in authentication, on rare occasions the validation/verification may involve the authentication of documentation.

A.2 Sufficiency and appropriateness of evidence

Sufficiency is the measure of the quantity of evidence. Appropriateness is the measure of the quality of evidence, i.e. its relevance and its reliability. The quantity of evidence needed is affected by the risk of the subject matter information being materially misstated (the greater the risk, the more evidence is likely to be required) and also by the quality of such evidence (the higher the quality, the less may be required). Accordingly, the sufficiency and appropriateness of evidence are interrelated. However, merely obtaining more evidence may not compensate for its poor quality.

The reliability of evidence is influenced by its source and by its nature, and is dependent on the individual circumstances under which it is obtained. Generalizations about the reliability of various kinds of evidence can be made; however, such generalizations are subject to important exceptions. Even when evidence is obtained from sources external to the organization, circumstances may exist that could affect the reliability of the information obtained.

EXAMPLE 1 Evidence obtained from an independent external source might not be reliable if the source is not knowledgeable.

While recognizing that exceptions may exist, the following generalizations about the reliability of evidence may be useful:

— evidence is more reliable when it is obtained from independent sources outside the organization;

— evidence that is generated internally is more reliable when the related controls are effective;

— evidence obtained directly by the validation team or verification team is more reliable than evidence obtained indirectly or by inference, e.g. observation of the application of a control is more reliable than inquiry about the application of a control;

— evidence is more reliable when it exists in documentary form, whether paper, electronic, or other media, e.g. a contemporaneously written record of a meeting is more reliable than a subsequent oral representation of what was discussed;

— evidence provided by original documents is more reliable than evidence provided by photocopies or facsimiles.

Members of the validation team or the verification team ordinarily obtain more assurance from consistent evidence obtained from different sources or of a different nature than from items of evidence considered individually. In addition, obtaining evidence from different sources or of a different nature may indicate that an individual item of evidence is not reliable.

EXAMPLE 2 Corroborating information obtained from a source independent of the organization can increase the assurance the validation team or verification team obtains from a representation from the responsible party.

Conversely, when evidence obtained from one source is inconsistent with that obtained from another, the validation team or verification team determines what additional evidence-gathering procedures are necessary to resolve the inconsistency.

In terms of obtaining sufficient appropriate evidence, it is generally more difficult to obtain assurance about subject matter information covering a period than about subject matter information at a point in time. In addition, conclusions provided on processes are ordinarily limited to the period covered by the engagement; members of the validation team or the verification team provide no conclusion about whether the process will continue to function in the specified manner in the future.

The validation team or verification team considers the relationship between the cost of obtaining evidence and the usefulness of the information obtained. However, the matter of difficulty or expense involved is not in itself a valid basis for omitting an evidence-gathering procedure for which there is no alternative. The validation team or verification team uses professional judgement and exercises professional scepticism in evaluating the quantity and quality of evidence, and thus its sufficiency and appropriateness, to support the assurance report.

NOTE Adapted from International Framework for Assurance Engagements[16], paragraphs 39-46.

Annex B
(informative)

Methods to evaluate the competence of validation team and verification team members

Evaluation method	Objectives	Examples
Records review	To verify the knowledge of validation team or verification team members	Analysis of records of education, personnel certification, training, professional experience and validation or verification experience
Positive and negative feedback	To receive information about how the performance of the validation team or verification team is perceived, including behaviour	Surveys, questionnaires, personal references, testimonials, complaints, performance evaluation and reviews.
Interview	To evaluate personal behaviour and communication skills, to verify information, to test knowledge and to acquire additional information	Face-to-face and telephone interviews
Observation	To evaluate personal behaviour and the ability to apply knowledge and skills	Role playing, witnessed validations/ verifications, on-the-job performance
Examination and testing	To evaluate personal behaviour and the application of knowledge and skills	Oral and written exams, psychometric testing
Post-validation/ verification review	To evaluate knowledge or performance	Review of the validation or verification statement and discussion with the client, responsible party, and with the validation team and verification team

Annex C
(informative)

Sector competence

NOTE See definition 3.1.1 and Clause 6.

Examples of sectors are presented in Table C.1 and competencies are identified for each sector. This list of sectors and GHG emission and removal activities is not exhaustive. For a given validation or verification engagement, the team might need to be competent in more than one sector. For example, for carbon capture and storage engagements, a team would need to be competent in sector 2 and sector 5. For a landfill site, a team would have to be competent in sector 1, sector 2 (assuming the methane is combusted), and sector 6. As each engagement is unique, the applicable competence will have to be determined and reflected in the engagement team.

Table C.1 — Examples of sector competence

1 Direct GHG emissions[a] (excluding process emissions) and energy indirect GHG emissions[b]
Sector competence requires knowledge and understanding of the generation, reduction, or avoidance of GHG emissions and monitoring activities associated with: — the production of energy due to the stationary combustion of fossil fuel, — energy generation from renewable sources (if applicable), — mobile sources (if applicable) generally associated with the combustion of fossil and biofuels, — fugitive and venting sources (if applicable), — flaring sources (if applicable), and — co-generation (if applicable). NOTE 1 This sector includes, but is not limited to, oil and gas production, manufacturing, mining, metals production, construction, pipeline, and energy generation. NOTE 2 Mobile emission sources can include, but are not limited to, emissions from aviation, road transportation, railways, marine and off-road transportation.
2 Process GHG emissions (non-combustion, chemical reaction and other)
Sector competence requires knowledge and understanding of the generation, reduction, or avoidance of GHG emissions and monitoring activities associated with: — industrial processes including, but not limited to, chemical production, manufacturing, oil and gas refining, and non-combustion processes involving the avoidance, replacement, destruction, decomposition or mitigation of industrial gas emissions (HFCs, PFCs, SF_6, N_2O, ozone depleting substances, etc.), and — purification processes associated with carbon capture and storage (e.g. amine solution capture systems).
3 GHG emissions and removals from Agriculture, Forestry and Other Land Use (AFOLU)
Sector competence requires knowledge and understanding of the generation, reduction, avoidance, removal or removal enhancements of GHG emissions and monitoring activities associated with: — carbon sequestration in biomass and vegetation, — estimation of rates of vegetation growth and crop yield, — precipitation/evapo-transpiration process, — biological nitrogen fixation process, crop residue nitrogen, and N_2O emissions, and — soil organic carbon stock. NOTE This sector includes, but is not limited to, reforestation, deforestation, forest management, agriculture, croplands/soil management, grassland management, revegetation, avoided deforestation, wetlands and sediments.

Table C.1 (*continued*)

4 GHG emissions from livestock
Sector competence requires knowledge and understanding of the generation, reduction, or avoidance of GHG emissions and monitoring activities associated with: — livestock/enteric fermentation and its variation due to changes in its management.
5 Carbon storage in geological reservoirs
Sector competence requires knowledge and understanding of the generation, reduction, or avoidance of GHG emissions and monitoring activities associated with: — evaluation of appropriate sites for storage, — carbon storage in geological formations (e.g. reservoir), and — seepage from carbon storage (e.g. permanence).
6 GHG emissions from decomposition of waste material
Sector competence requires knowledge and understanding of the generation, reduction, or avoidance of GHG emissions and monitoring activities associated with: — disposals including, but not limited to, landfills, composting facilities, waste water treatment, manure management, and other waste management processes.
[a] "Direct greenhouse gas emission" is defined in ISO 14064-1:2006, definition 2.8. [b] "Energy indirect greenhouse gas emission" is defined in ISO 14064-1:2006, definition 2.9.

Annex D
(informative)

Relationship between validation and verification competence requirements in ISO 14065:2007 and skills and abilities needed by validation teams and verification teams

Table D.1 shows the relationship between the validation and verification competence requirements in ISO 14065:2007, 6.3.2 to 6.3.6, and the skills and abilities needed by validation teams and verification teams.

NOTE The *UFE Candidates' Competency Map: Understanding the Professional Competencies Evaluated on the UFE*[17] was referred to as a source of information in the development of this annex.

Table D.1 — Relationship between validation and verification competence requirements in ISO 14065:2007 and skills and abilities needed by validation teams and verification teams

ISO 14065:2007 competency requirement	Skill and ability of the validation team or verification team
6.3.2 Validation or verification team knowledge	
The validation or verification team shall have detailed knowledge of the applicable GHG programme, including its a) eligibility requirements b) implementation in different jurisdictions as applicable c) validation or verification requirements and guidelines	— Identify what set of rules or policies best applies to the material being evaluated.
The validation or verification team shall be able to communicate effectively in appropriate languages on matters relevant to the validation or verification.	— Share and distribute relevant information through written communications (reports, letters, memos, e-mails). — Conduct verbal communications in an appropriate language, and in a professional manner. — Present information effectively, in written or graphic form, in a format that is well understood by all parties.

Table D.1 (*continued*)

ISO 14065:2007 competency requirement		Skill and ability of the validation team or verification team
6.3.3 Validation or verification team technical expertise		
The validation or verification team shall have sufficient technical expertise to assess the GHG project's or organization's	a) specific GHG activity and technology	— Identify and understand which key operations impact the project's or organization's GHG performance. — Understand the actual operational processes being used.
	b) identification and selection of GHG sources, sinks or reservoirs	— Identify and understand which key operations impact the project's or organization's GHG performance. — Understand the actual operational processes being used.
	c) quantification, monitoring and reporting, including relevant technical and sector issues	— Identify information that needs to be verified. — Assess the selection, use and maintenance of measurement and calibration devices. — Determine the extent of testing needed to validate the completeness, accuracy and reliability of information used in the analysis. — Identify corroborating information that will strengthen the ability to draw sound conclusions about the information. — Conclude, based on the work done, whether to accept or reject the information or whether to modify the testing. — Identify the purpose of the computation(s) and whether a precise calculation, an estimate, a forecast, or a projection is required. — Identify supporting facts, data, and knowledge of trends necessary (i.e. when a computation involves a forecast or projection) to achieve the purpose, and state key assumptions.

	d) situations that may affect the materiality of the GHG assertion, including typical and atypical operating conditions	— Develop an understanding of the project's or organization's operating environment using information obtained from a variety of sources, including:
		  — stakeholders,
		  — critical success factors for the industry/sector,
		  — exposure to uncertainties (e.g. political, financial, technological, etc.),
		  — environmental shifts that might affect the organization (e.g. emerging market trends, legislative and regulatory changes, etc.).
		— Identify the specific risks that could result in material misstatement of the subject matter, including fraud risk factors based on the team's independent risk assessment of the project or organization.
		— Assess the specific risk level.
		— Evaluate the impact of the risk assessment on the nature, timing and extent of assurance work to be performed.
		— Identify the factors that affect materiality.
		— Determine a planning materiality level.

The validation or verification team shall have expertise to evaluate the implications of financial, operational, contractual or other agreements that may affect GHG project or organization boundaries, including any legal requirements related to the GHG assertion		— Seek familiarity with the legal framework within which the organization operates. — Assess the impact of relevant regulations on routine and long-term activities and decisions. — Obtain and apply a general understanding of basic legal concepts when performing work such as financial, operational, contractual or other agreements that could affect the GHG assertion.

Table D.1 (*continued*)

ISO 14065:2007 competency requirement		Skill and ability of the validation team or verification team
6.3.4 Validation or verification team data and information auditing expertise		
The validation or verification team shall have data and information auditing expertise to assess the GHG assertion of the GHG project or organization, including the ability	a) to assess the GHG information system to determine whether the project proponent or organization has effectively identified, collected, analysed and reported on the data necessary to establish a credible GHG assertion, and has systematically taken corrective actions to address any non-conformities related to requirements of the relevant GHG programme or standards	— Identify the purpose of gathering information or researching an issue. — Use appropriate methods for obtaining or developing the information needed (e.g. internal or external resources, document reviews, observation of activities, interviews, etc.). — Identify the purpose of the analysis and the information or ideas and material to be considered. — Integrate ideas and information from various sources. — Compare information from internal or external sources as needed to achieve the identified purpose. — Make logical inferences. — Form an opinion on the outcome of an issue or on the impact of the information on a situation, taking into account the identified purpose, the information gathered and the analysis of that information.
	b) to design a sampling plan based on an appropriate, agreed level of assurance	— For a given set of circumstances, decide on: — the form, the extent and quality of evidence required to support the GHG assertion, — the most efficient testing procedures (e.g. tests of control and/or substantive procedures) to obtain the evidence, — the need for an IT specialist or the need to use computer-assisted audit techniques to gather evidence. — Communicate the plan to relevant stakeholders. — Alert to changes in circumstances not considered in the sampling plan and adjust appropriately.
	c) to analyse risks associated with the use of data and data systems	— Evaluate data, data sources, applicable processes, and controls to determine significant sources of risk. — Identify, analyse and discuss how the organization manages risks related to data systems/the IT environment, processes and emerging technologies in order to ensure system availability, integrity and security, i.e.: — how the project or organization manages the risk related to the IT environment, — how the project or organization manages the risk associated with each application, — how the project or organization manages the implementation of new technologies.
	d) to identify failures in data and data systems	— Perform the procedures specified in the sampling plan. — Apply an appropriate level of scepticism, remaining alert to the possibility of false information (i.e. fraud). — Identify and gain an understanding of key controls. — Test the functioning of the IT controls. — Understand the implications of deficiencies identified. — For each procedure performed, ensure that the documentation provides a clear link to significant findings or issues that arose during the assignment. — Ensure the documentation contains sufficient information to support the nature, timing and extent of procedures performed and the results of the procedures. — Draw a conclusion on whether the procedure meets its objective. — Modify the work/sampling plan as necessary.

Table D.1 (*continued*)

ISO 14065:2007 competency requirement		Skill and ability of the validation team or verification team
	e) to assess the impact of the various streams of data on the materiality of the GHG assertion	— Evaluate the sufficiency and significance of the evidence and/or results of analysis. — Identify inconsistencies, unexpected circumstances, unexpected findings, or findings that indicate possible fraud or error. — Determine whether the subject matter conforms with the rules, standards, or policies used for evaluation. — Identify the impact of findings on the scope of the assignment or the assurance/work plan. — Evaluate the overall adequacy of documentation. — Analyse and decide on the reasonableness of the conclusions on the subject matter, based on an understanding of the nature of the business and its operations for the period and on the outcome of validation or verification procedures. — Analyse the impact of errors in the context of materiality, and decide on the need to gather additional evidence or to extend the scope of procedures. — In the case of the reported GHG assertion, evaluate the appropriateness of the conclusions in accordance with applicable criteria.
6.3.5 Specific GHG project validation team competencies		
In addition to the requirements given in 6.3.2, 6.3.3 and 6.3.4, the validation team shall have the expertise to assess processes, procedures and methodologies used	a) to select, justify and quantify the baseline scenario, including underlying assumptions	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to select, justify and quantify the baseline scenario. — Assess criteria/assumptions used for determining the baseline scenario. — Be familiar with quantification methodologies for development of the baseline scenario, including knowledge of business as usual/common practices within the sector. — Analyse information and make logical inferences.
	b) to determine the conservativeness of the baseline scenario	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to determine the conservativeness of the baseline. — Assess criteria used for determining the “conservativeness” of the baseline scenario. — Analyse information and make logical inferences.
	c) to define the baseline scenario and GHG project boundaries	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies). — Assess criteria used for defining the baseline scenario and project boundaries. — Be familiar with quantification methodologies for development of the baseline scenario, including knowledge of business as usual/common practices within sectors. — Review and confirm project boundaries (e.g. by visual inspection, process flow diagram review). — Analyse information and make logical inferences.

Table D.1 (*continued*)

ISO 14065:2007 competency requirement		Skill and ability of the validation team or verification team
	d) to demonstrate equivalence between the type and level of activities, goods or services of the baseline scenario and the GHG project	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to determine functional equivalence. — Assess criteria used for determining functional equivalence. — Analyse information and make logical inferences.
	e) to demonstrate that GHG project activities are additional to baseline scenario activities	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to demonstrate that the project activities are additional to the baseline scenario. — Assess criteria/assumptions used for determining additionality. — Analyse information and make logical inferences.
	f) to demonstrate conformity, if appropriate, with GHG programme requirements such as leakage and permanence	— Identify GHG programme requirements. — Assess the project's conformity to identified GHG programme requirements.
In addition to the requirements given in 6.3.2, 6.3.3 and 6.3.4, the validation team shall have knowledge of relevant sector trends that may impact selection of the baseline scenario.		— Develop an understanding of the operating environment/ sector (through previous education or experience). — Identify sector trends that can impact the baseline selection. — Understand baseline scenario selection process.
6.3.6 Specific GHG project verification team competencies		
In addition to the requirements given in 6.3.2, 6.3.3 and 6.3.4, the project verification team shall have the expertise appropriate to assess processes, procedures or methodologies used	a) to evaluate consistency between the validated GHG project plan and the GHG project implementation	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to evaluate consistency between the project plan and project implementation. — Gather and assess information that would allow for a comparison of the project validation plan and the project that has been implemented. — Analyse data and information and confirm whether the project has been implemented in a manner consistent with the project pan. — Visually inspect and/or observe the project and evaluate if it has been implemented in accordance with the validated project plan.
	b) to confirm the ongoing appropriateness of the validated GHG project plan, including its baseline scenario and underlying assumptions	— Identify the purpose of the assessment and information to be considered (including processes, procedures and methodologies) to evaluate ongoing appropriateness of the validated project plan. — Gather and assess information that would allow for confirmation of ongoing appropriateness. — Analyse data and information and confirm whether the project plan is still appropriate.
Other competency requirement		
Validation or verification team expertise to report on the results of the validation or verification		— Prepare information in presentation or report format for timely discussion with management, those with oversight responsibility for reporting (where appropriate), and other stakeholders, on matters such as: — the results of the validation or verification procedures, — misstatements arising from false information (i.e. fraud), — misstatements arising from error, — any other item required due to the nature of the assignment (e.g. applicable statutory requirements).

Annex E
(informative)

Example of prerequisite entry level awareness for individuals starting training as team members in a validation team or a verification team

E.1 General

Individuals starting training as team members in a validation team or a verification team (referred to as "trainees") should possess an interest in validation or verification and exhibit personal behaviour suitable for participating in validation teams or verification teams. E.2 and E.3 provide an example of prerequisite awareness and abilities that trainees may possess at the beginning of their training process.

NOTE This does not apply to experts who might be additional to the team.

E.2 Awareness

Awareness can include the following:

a) general understanding of the interaction between GHG emissions associated with projects and organizations and climate change knowledge;

b) typical GHG emission sources, sinks and reservoirs and examples of emission factors and quantification of GHGs;

c) general understanding about the GHG programme applicable to the types of validation or verification the individual may eventually participate in as a team member;

d) common legal structures applicable to the management of organizations;

e) typical operation and control of GHG information systems.

E.3 Abilities

Abilities can include the following:

a) critical thinking and the ability to analyse multiple inputs;

b) willingness and capacity to think outside cultural constraints and norms;

c) capability to exercise professional scepticism;

d) capacity to carry out independent research and to challenge assumptions and evidence asserted by a responsible party or client;

e) capacity to strike a balance between "attention to detail" and a "high level assessment of the anticipated outcome" during the validation or verification process;

f) capability to manage and organize detail, particularly at the level of ensuring that required checks are performed (e.g. between a GHG project plan and the GHG project report, and between a GHG inventory and its corresponding report).

Annex F
(informative)

Personal behaviour

Personnel involved in GHG validation/verification activities should possess the necessary qualities to enable them to act in accordance with the principles of validation and verification as described in Clause 4. Personnel should exhibit professional behaviour during the performance of validation and verification activities that includes being the following:

a) ethical, i.e. fair, truthful, sincere, honest and discreet;

b) open-minded, i.e. willingness to consider alternative ideas or points of view;

c) diplomatic, i.e. tact in dealing with people;

d) observant, i.e. active observation of physical surroundings and activities;

e) perceptive, i.e. aware of and able to understand situations;

f) adaptable, i.e. adjusting readily to different situations;

g) tenacious, i.e. persistence, focus on achieving objectives;

h) decisive, i.e. reaching timely conclusions based on logical reasoning and analysis;

i) self-reliant, i.e. acting and functioning independently while interacting effectively with others;

j) acting with fortitude, i.e. willing to act responsibly and ethically even though these actions may not always be popular and may sometimes result in disagreement or confrontation;

k) well organized, i.e. exhibiting effective time management, prioritization, planning and efficiency;

l) open to improvement, i.e. learning from situations, striving for better audit results;

m) culturally sensitive, i.e. observing and respecting cultural traditions of the auditee;

n) a team player, i.e. working well with other audit team members.

NOTE This annex is adapted from ISO 19011:—.

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1) Under preparation.

2) To be published. (Revision of ISO 19011:2002)

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