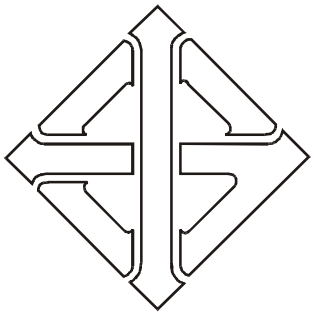

มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 14064 เล่ม 1 – 2552

ISO 14064 – 1 : 2006

ก๊าซเรือนกระจก :

เล่ม 1 ข้อกำหนดและข้อแนะนำระดับองค์กรสำหรับการวัดปริมาณและการรายงานผลการปลดปล่อยและลดปริมาณก๊าซเรือนกระจก

GREENHOUSE GASES -

PART 1 : SPECIFICATION WITH GUIDANCE AT THE ORGANIZATION LEVEL FOR QUANTIFICATION AND REPORTING OF GREENHOUSE GAS EMISSIONS AND REMOVALS

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

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มอก. 14064 เล่ม 1– 2552

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400
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ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 126 ตอนพิเศษ 132 ง
วันที่ 10 กันยายน พุทธศักราช 2552

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้เป็นส่วนหนึ่งในอนุกรมมาตรฐานผลิตภัณฑ์อุตสาหกรรมก๊าซเรือนกระจก ซึ่งกำหนดขึ้นเพื่อเป็นหลักการและข้อกำหนดระดับองค์กรสำหรับการวัดปริมาณและการรายงานผลการปลดปล่อยและลดปริมาณก๊าซเรือนกระจก รวมถึงข้อกำหนดสำหรับการออกแบบ การพัฒนา การจัดการ การรายงานและการทวนสอบบัญชีรายการก๊าซเรือนกระจกขององค์กร

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ได้รับ ISO 14064-1:2006 Greenhouse gases - Part 1 : Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้มาตรฐาน ISO ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นเพื่อให้ทันกับความต้องการของผู้ใช้ และจักแปลเป็นภาษาไทยในโอกาสอันสมควร หากมีข้อสงสัยโปรดติดต่อสอบถามที่สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตามมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511

ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 3987 (พ.ศ. 2552)

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ก๊าซเรือนกระจก :

เล่ม 1 ข้อกำหนดและข้อแนะนำระดับองค์กรสำหรับ

การวัดปริมาณและการรายงานผลการปลดปล่อย และลดปริมาณก๊าซเรือนกระจก

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ก๊าซเรือนกระจก : เล่ม 1 ข้อกำหนดและข้อแนะนำระดับองค์กรสำหรับการวัดปริมาณและการรายงานผลการปลดปล่อย และลดปริมาณก๊าซเรือนกระจก มาตรฐานเลขที่ มอก. 14064 เล่ม 1-2552 ไว้ ดังมีรายการละเอียดต่อท้ายประกาศนี้

ประกาศ ณ วันที่ 7 พฤษภาคม พ.ศ. 2552

ชาญชัย ชัยรุ่งเรือง

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

มาตรฐานผลิตภัณฑ์อุตสาหกรรม
ก๊าซเรือนกระจก :
เล่ม 1 ข้อกำหนดและข้อแนะนำระดับองค์กรสำหรับการวัดปริมาณและการรายงานผลการปลดปล่อยและลดปริมาณก๊าซเรือนกระจก

บทนำ

การเปลี่ยนแปลงสภาพอากาศ เป็นปรากฏการณ์ท้าทายที่ทุกชนชาติต้องเผชิญกับการเปลี่ยนแปลงครั้งสำคัญในการควบคุมปริมาณก๊าซเรือนกระจกที่ปลดปล่อยออกไปสู่บรรยากาศของโลก โดยเริ่มจากการวัดปริมาณ การเฝ้าระวัง การรายงาน และการทวนสอบการปลดปล่อยและลดปริมาณก๊าซเรือนกระจก

ขอบข่าย

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ระบุหลักการและข้อกำหนดระดับองค์กรสำหรับการวัดปริมาณและการรายงานผลการปลดปล่อย และลดปริมาณก๊าซเรือนกระจก รวมถึงข้อกำหนดสำหรับการออกแบบ การพัฒนา การจัดการ การรายงานและการทวนสอบบัญชีรายการการปลดปล่อยและการลดปริมาณก๊าซเรือนกระจกขององค์กร

เอกสารอ้างอิง

ไม่มีเอกสารอ้างอิง

บทนิยาม

ความหมายของคำที่ใช้ในมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ ให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 ข้อ 2

หลักการ

หลักการเป็นพื้นฐานสำคัญที่จะทำให้มั่นใจว่าข้อมูลเกี่ยวกับก๊าซเรือนกระจกมีความถูกต้องและมีเหตุผล และเป็นแนวทางในการประยุกต์ใช้ข้อกำหนด

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 ข้อ 3.1 ถึง 3.6

ข้อกำหนด

ข้อกำหนดระดับองค์กรระบุไว้ 5 เรื่อง ได้แก่ การออกแบบและพัฒนาบัญชีรายการก๊าซเรือนกระจก ส่วนประกอบของบัญชีรายการก๊าซเรือนกระจก การจัดการคุณภาพบัญชีรายการก๊าซเรือนกระจก การรายงานเกี่ยวกับก๊าซเรือนกระจก บทบาทขององค์กรในกิจกรรมการทวนสอบ

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 ข้อ 4 ถึง 8

ภาคผนวก

การรวบรวมข้อมูลระดับองค์กร

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 Annex A

ตัวอย่างของกิจกรรมที่ส่งผลให้เกิดการปลดปล่อยก๊าซเรือนกระจกทางอ้อม

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 Annex B

ศักยภาพการทำให้โลกร้อนของก๊าซเรือนกระจกชนิดต่าง ๆ

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 14064-1:2006 Annex C

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Contents

Page

1 Scope **1**
2 Terms and definitions **1**
3 Principles **6**
3.1 General **6**
3.2 Relevance **6**
3.3 Completeness **6**
3.4 Consistency **6**
3.5 Accuracy **6**
3.6 Transparency **6**
4 GHG inventory design and development **6**
4.1 Organizational boundaries **6**
4.2 Operational boundaries **7**
4.3 Quantification of GHG emissions and removals **8**
5 GHG inventory components **10**
5.1 GHG emissions and removals **10**
5.2 Organizational activities to reduce GHG emissions or increase GHG removals **10**
5.3 Base-year GHG inventory **11**
5.4 Assessing and reducing uncertainty **12**
6 GHG inventory quality management **12**
6.1 GHG information management **12**
6.2 Document retention and record keeping **12**
7 Reporting of GHG **13**
7.1 General **13**
7.2 Planning the GHG report **13**
7.3 GHG report content **13**
8 Organization's role in verification activities **14**
8.1 General **14**
8.2 Preparing for verification **14**
8.3 Verification management **15**
Annex A (informative) **Consolidating facility-level data to the organization level** **17**
Annex B (informative) **Examples of other indirect greenhouse gas emissions** **18**
Annex C (informative) **Greenhouse gas global warming potentials** **19**
Bibliography **20**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 14064-1 was prepared by Technical Committee ISO/TC 207, *Environmental management*.

ISO 14064 consists of the following parts, under the general title *Greenhouse gases*:

— *Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*

— *Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*

— *Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*

Introduction

0.1 Climate change has been identified as one of the greatest challenges facing nations, governments, business and citizens over future decades. Climate change has implications for both human and natural systems and could lead to significant changes in resource use, production and economic activity. In response, international, regional, national and local initiatives are being developed and implemented to limit greenhouse gas (GHG) concentrations in the Earth's atmosphere. Such GHG intitiatives rely on the quantification, monitoring, reporting and verification of GHG emissions and/or removals.

This part of ISO 14064 details principles and requirements for designing, developing, managing and reporting organization- or company-level GHG inventories. It includes requirements for determining GHG emission boundaries, quantifying an organization's GHG emissions and removals, and identifying specific company actions or activities aimed at improving GHG management. It also includes requirements and guidance on inventory quality management, reporting, internal auditing and the organization's responsibilities for verification activities.

ISO 14064-2 focuses on GHG projects or project-based activities specifically designed to reduce GHG emissions or increase GHG removals. It includes principles and requirements for determining project baseline scenarios and for monitoring, quantifying and reporting project performance relative to the baseline scenario and provides the basis for GHG projects to be validated and verified.

ISO 14064-3 details principles and requirements for verifying GHG inventories and validating or verifying GHG projects. It describes the process for GHG-related validation or verification and specifies components such as validation or verification planning, assessment procedures and the evaluation of organization or project GHG assertions. ISO 14064-3 can be used by organizations or independent parties to validate or verify GHG assertions.

Figure 1 displays the relationship between the three parts of ISO 14064.

0.2 ISO 14064 is expected to benefit organizations, governments, project proponents and stakeholders worldwide by providing clarity and consistency for quantifying, monitoring, reporting and validating or verifying GHG inventories or projects. Specifically, use of ISO 14064 could

— enhance the environmental integrity of GHG quantification,

— enhance the credibility, consistency and transparency of GHG quantification, monitoring and reporting, including GHG project emission reductions and removal enhancements,

— facilitate the development and implementation of an organization's GHG management strategies and plans,

— facilitate the development and implementation of GHG projects,

— facilitate the ability to track performance and progress in the reduction of GHG emissions and/or increase in GHG removals, and

— facilitate the crediting and trade of GHG emission reductions or removal enhancements.

Users of ISO 14064 could find benefit from some of the following applications:

a) corporate risk management: for example, the identification and management of risks and opportunities;

b) voluntary initiatives: for example, participation in voluntary GHG registry or reporting initiatives;

c) GHG markets: for example, the buying and selling of GHG allowances or credits;

d) regulatory/government reporting: for example, credit for early action, negotiated agreements or national reporting programmes.

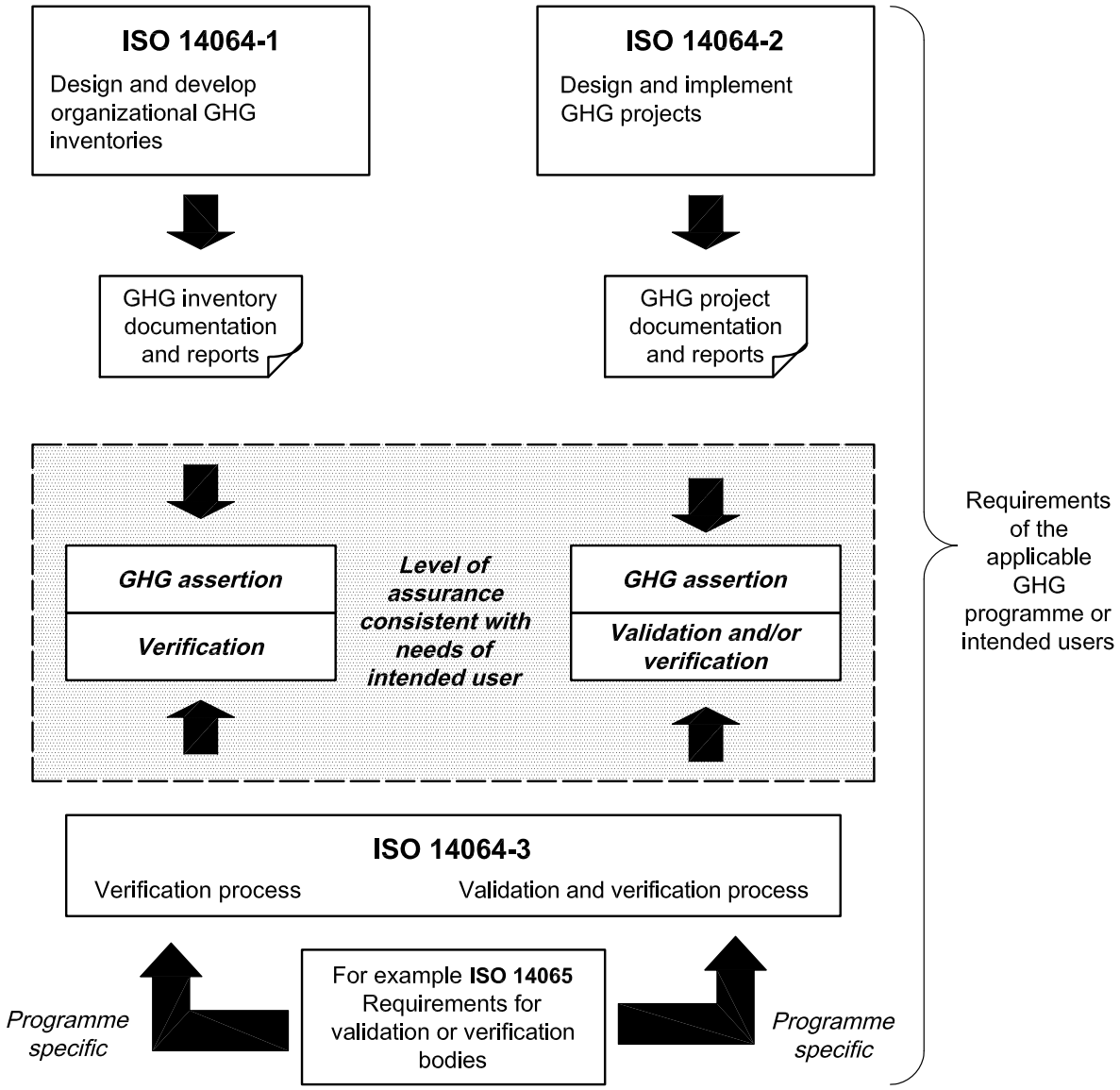


Figure 1 — Relationship between the parts of ISO 14064

0.3 Consistent with the objective of building on existing International Standards and protocols on corporate GHG inventories, this part of ISO 14064 incorporates many key concepts and requirements stated by World Business Council for Sustainable Development/World Resources Institute in Reference [4]. Users of this part of ISO 14064 are encouraged to refer to Reference [4] for additional guidance on applying relevant concepts and requirements.

0.4 Some clauses require users of this part of ISO 14064 to explain the use of certain approaches or decisions taken. Explanation will generally include documentation of the following:

— How approaches were used or decisions taken.

— Why approaches were chosen or decisions made.

Some clauses require users of this part of ISO 14064 to justify the use of certain approaches or decisions taken. Justification will generally include documentation of the following:

— How approaches were used or decisions taken.

— Why approaches were chosen or decisions made.

— Why alternative approaches were not chosen.

Greenhouse gases —

Part 1:
Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

1 Scope

This part of ISO 14064 specifies principles and requirements at the organization level for quantification and reporting of greehouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.

ISO 14064 is GHG programme neutral. If a GHG programme is applicable, requirements of that GHG programme are additional to the requirements of ISO 14064.

NOTE If a requirement of ISO 14064 prohibits an organization or a GHG project proponent from complying with a requirement of the GHG programme, the requirement of the GHG programme takes precedence.

2 Terms and definitions

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

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).

2.2
greenhouse gas source
physical unit or process that releases a GHG into the atmosphere

2.3
greenhouse gas sink
physical unit or process that removes a GHG from the atmosphere

2.4
greenhouse gas reservoir
physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a **greenhouse gas sink** (2.3) or a GHG captured from a **greenhouse gas source** (2.2)

NOTE 1 The total mass of carbon contained in a GHG reservoir at a specified point in time could be referred to as the carbon stock of the reservoir.

NOTE 2 A GHG reservoir can transfer greenhouse gases to another GHG reservoir.

NOTE 3 The collection of a GHG from a GHG source before it enters the atmosphere and storage of the collected GHG in a GHG reservoir could be referred to as GHG capture and storage.

2.5
greenhouse gas emission
total mass of a GHG released to the atmosphere over a specified period of time

2.6
greenhouse gas removal
total mass of a GHG removed from the atmosphere over a specified period of time

2.7
greenhouse gas emission or removal factor
factor relating activity data to GHG emissions or removals

NOTE A greenhouse gas emission or removal factor could include an oxidation component.

2.8
direct greenhouse gas emission
GHG emission from **greenhouse gas sources** (2.2) owned or controlled by the organization

NOTE This part of ISO 14064 uses the concepts of financial and operational control to establish an organization's operational boundaries.

2.9
energy indirect greenhouse gas emission
GHG emission from the generation of imported electricity, heat or steam consumed by the organization

2.10
other indirect greenhouse gas emission
GHG emission, other than energy indirect GHG emissions, which is a consequence of an organization's activities, but arises from **greenhouse gas sources** (2.2) that are owned or controlled by other organizations

2.11
greenhouse gas activity data
quantitative measure of activity that results in a GHG emission or removal

NOTE Examples of GHG activity data include the amount of energy, fuels or electricity consumed, material produced, service provided or area of land affected.

2.12
greenhouse gas assertion
declaration or factual and objective statement made by the **responsible party** (2.23)

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

NOTE 2 The GHG assertion provided by the responsible party should be clearly identifiable, capable of consistent evaluation or measurement against suitable criteria by a **validator** (2.34) or **verifier** (2.36).

NOTE 3 The GHG assertion could be provided in the form of a **greenhouse gas report** (2.17) or GHG project plan.

2.13
greenhouse gas information system
policies, processes and procedures to establish, manage and maintain GHG information

2.14
greenhouse gas inventory
an organization's **greenhouse gas sources** (2.2), **greenhouse gas sinks** (2.3), GHG emissions and removals

2.15
greenhouse gas project
activity or activities that alter the conditions identified in the baseline scenario which cause GHG emission reductions or GHG removal enhancements

2.16
greenhouse gas programme
voluntary or mandatory international, national or sub-national system or scheme that registers, accounts or manages GHG emissions, removals, emission reductions or removal enhancements outside the organization or **greenhouse gas project** (2.15)

2.17
greenhouse gas report
stand-alone document intended to communicate an organization's or project's GHG-related information to its **intended users** (2.24)

NOTE A GHG report can include a **greenhouse gas assertion** (2.12).

2.18
global warming potential
GWP
factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period of time

NOTE Annex C contains global warming potentials produced by the Intergovernmental Panel on Climate Change.

2.19
carbon dioxide equivalent
CO_2e
unit for comparing the radiative forcing of a GHG to carbon dioxide

NOTE 1 The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its **global warming potential** (2.18).

NOTE 2 Annex C contains global warming potentials produced by the Intergovernmental Panel on Climate Change.

2.20
base year
historical period specified for the purpose of comparing GHG emissions or removals or other GHG-related information over time

NOTE Base-year emissions or removals may be quantified based on a specific period (e.g. a year) or averaged from several periods (e.g. several years).

2.21
facility
single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

2.22
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

2.23
responsible party
person or persons responsible for the provision of the **greenhouse gas assertion** (2.12) 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** (2.34) or **verifier** (2.36). The validator or verifier may be engaged by the client or by other parties, such as the GHG programme administrator.

2.24
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 can be the **client** (2.25), the **responsible party** (2.23), GHG programme administrators, regulators, the financial community or other affected stakeholders (such as local communities, government departments or non-governmental organizations).

2.25
client
organization or person requesting **validation** (2.31) or **verification** (2.35)

NOTE The client could be the **responsible party** (2.23), the GHG programme administrator or another stakeholder.

2.26
directed action
specific activity or initiative, not organized as a **greenhouse gas project** (2.15), implemented by an organization to reduce or prevent direct or indirect GHG emissions or increase GHG removals

NOTE 1 ISO 14064-2 defines a GHG project.

NOTE 2 Directed actions can be continuous or discrete.

NOTE 3 GHG emission or removal differences that result from directed actions may occur within or outside the organizational boundaries.

2.27
level of assurance
degree of assurance the **intended user** (2.24) requires in a **validation** (2.31) or **verification** (2.35)

NOTE 1 The level of assurance is used to determine the depth of detail that a validator or verifier designs into their validation or verification plan to determine if there are any material errors, omissions or misrepresentations.

NOTE 2 There are two levels of assurance (reasonable or limited) that result in differently worded validation or verification statements. Refer to ISO 14064-3:2006, A.2.3.2, for examples of validation and verification statements.

2.28
materiality
concept that individual or an aggregate of errors, omissions and misrepresentations could affect the **greenhouse gas assertion** (2.12) and could influence the **intended users'** (2.24) 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** (2.29) (detection risk).

NOTE 2 The concept of materiality is used to identify information that, if omitted or mis-stated, would significantly mis-represent 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. See ISO 14064-3:2006, A.2.3.8, for further explanation of this relationship.

2.29
material discrepancy
individual or an aggregate of actual errors, omissions and misrepresentations in the **greenhouse gas assertion** (2.12) that could affect the decisions of the **intended users** (2.24)

2.30
monitoring
continuous or periodic assessment of GHG emissions and removals or other GHG-related data

2.31
validation
systematic, independent and documented process for the evaluation of a **greenhouse gas assertion** (2.12) in a GHG project plan against agreed **validation criteria** (2.32)

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 14064-3:2006, 5.2.

2.32
validation criteria
verification criteria
policy, procedure or requirement used as a reference against which evidence is compared

NOTE Validation or verification criteria may be established by governments, GHG programmes, voluntary reporting initiatives, standards or good practice guidance.

2.33
validation statement
verification statement
formal written declaration to the **intended user** (2.24) that provides assurance on the statements in the **greenhouse gas assertion** (2.12) of the **responsible party** (2.23)

NOTE Declaration by the validator or verifier can cover claimed GHG emissions, removals, emission reductions or removal enhancements.

2.34
validator
competent and independent person or persons with responsibility for performing and reporting on the results of a validation

NOTE This term can be used to refer to a validation body.

2.35
verification
systematic, independent and documented process for the evaluation of a **greenhouse gas assertion** (2.12) against agreed **verification criteria** (2.32)

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.

2.36
verifier
competent and independent person, or persons, with responsibility for performing and reporting on the verification process

NOTE This term can be used to refer to a verification body.

2.37
uncertainty
parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to the quantified amount

NOTE Uncertainty information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.

3 Principles

3.1 General

The application of principles is fundamental to ensure that GHG-related information is a true and fair account. The principles are the basis for, and will guide the application of, requirements in this part of ISO 14064.

3.2 Relevance

Select the GHG sources, GHG sinks, GHG reservoirs, data and methodologies appropriate to the needs of the intended user.

3.3 Completeness

Include all relevant GHG emissions and removals.

3.4 Consistency

Enable meaningful comparisons in GHG-related information.

3.5 Accuracy

Reduce bias and uncertainties as far as is practical.

3.6 Transparency

Disclose sufficient and appropriate GHG-related information to allow intended users to make decisions with reasonable confidence.

4 GHG inventory design and development

4.1 Organizational boundaries

The organization may comprise one or more facilities. Facility-level GHG emissions or removals may be produced from one or more GHG sources or sinks. Figure 2 shows the relationship between GHG sources, sinks and facilities.

The organization shall consolidate its facility-level GHG emissions and removals by one of the following approaches:

a) control: the organization accounts for all quantified GHG emissions and/or removals from facilities over which it has financial or operational control; or

b) equity share: the organization accounts for its portion of GHG emissions and/or removals from respective facilities.

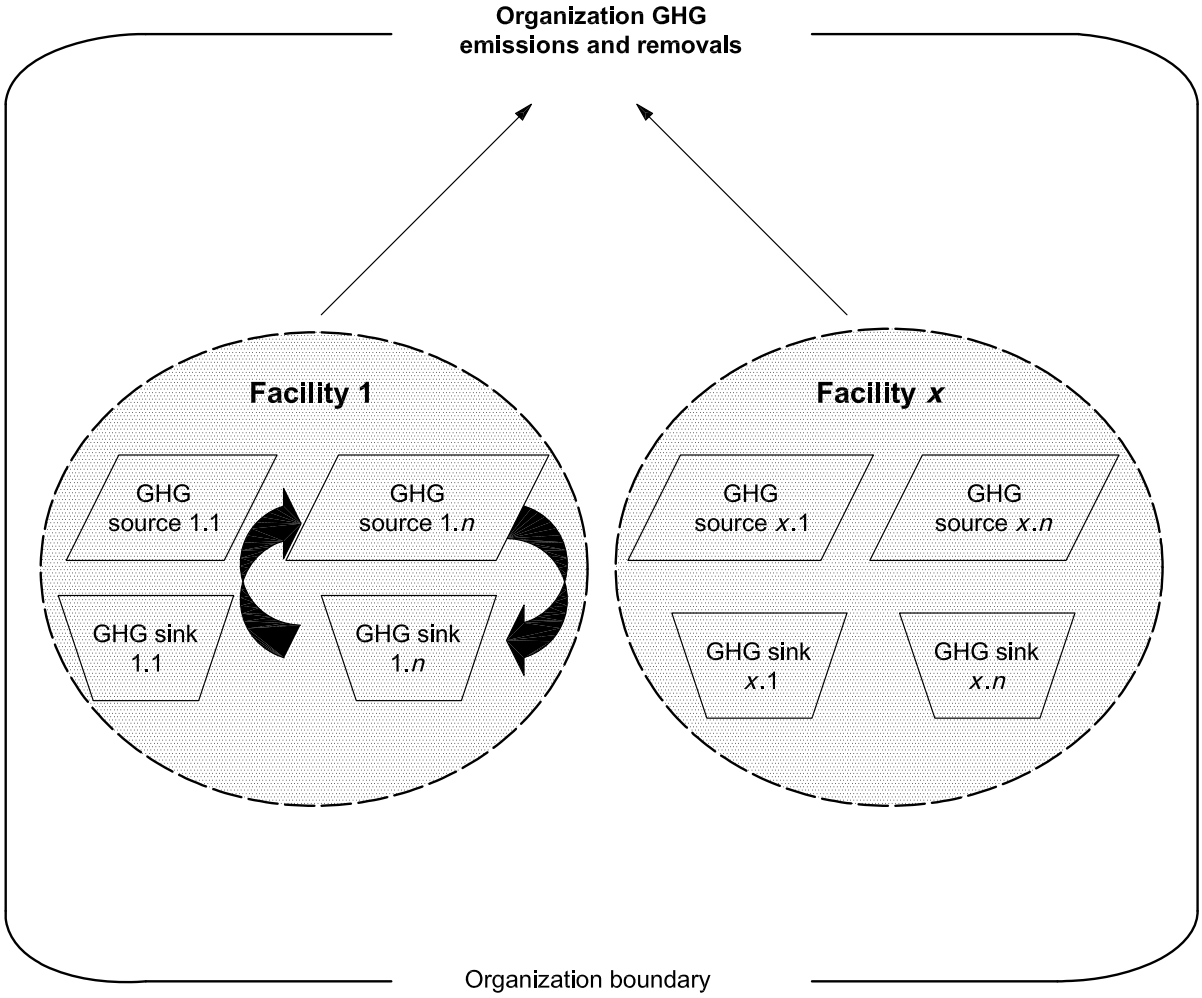
The organization may use a different consolidation methodology where specific arrangements are defined by a GHG programme or legal contract.

When a facility is controlled by several organizations, these organizations should adopt the same consolidation methodology.

The organization shall document which consolidation method it applies.

The organization shall explain any change to the selected consolidation method.

Guidance on applying control and equity share approaches to consolidate facility-level GHG emissions and removals to the organization level is included in Annex A.



Key

x is the number of facilities within the organizational boundary

n is the number of GHG sources or sinks at the facility

NOTE 1 An organization's GHG emissions and removals are aggregated from facility-level quantification of GHG sources and sinks.

NOTE 2 The organization ought to be aware that a GHG sink in one period might become a GHG source in another period or vice versa.

Figure 2 — Relationship between GHG sources, sinks and facilities

4.2 Operational boundaries

4.2.1 Establishing operational boundaries

The organization shall establish and document its operational boundaries. The establishment of operational boundaries includes identifying GHG emissions and removals associated with the organization's operations, categorizing GHG emissions and removals into direct emissions, energy indirect emissions and other indirect

emissions. It includes choosing which of the other indirect emissions will be quantified and reported. The organization shall explain any changes to its operational boundaries.

4.2.2 Direct GHG emissions and removals

The organization shall quantify direct GHG emissions from facilities within its organizational boundaries.

The organization should quantify GHG removals from facilities within its organizational boundaries.

Direct GHG emissions from electricity, heat and steam generated and exported or distributed by the organization may be reported separately, but shall not be deducted from the organization's total direct GHG emissions.

NOTE The term “exported” refers to electricity, heat or steam that is supplied by the organization to users outside the organizational boundaries.

CO_2 emissions from the combustion of biomass shall be quantified separately.

4.2.3 Energy indirect GHG emissions

The organization shall quantify indirect GHG emissions from the generation of imported electricity, heat or steam consumed by the organization.

NOTE The term “imported” refers to electricity, heat or steam that is supplied from outside the organizational boundaries.

4.2.4 Other indirect GHG emissions

The organization may quantify other indirect GHG emissions based on requirements of the applicable GHG programme, internal reporting needs or the intended use for the GHG inventory.

NOTE Examples of organizational activities that might result in other indirect emissions are included in Annex B.

4.3 Quantification of GHG emissions and removals

4.3.1 Quantification steps and exclusions

Within its organizational boundaries, the organization shall quantify and document GHG emissions and removals by completing, as applicable, the following steps:

a) identification of GHG sources and sinks (4.3.2);

b) selection of quantification methodology (4.3.3);

c) selection and collection of GHG activity data (4.3.4);

d) selection or development of GHG emission or removal factors (4.3.5);

e) calculation of GHG emissions and removals (4.3.6).

The organization may exclude from quantification direct or indirect GHG sources or sinks whose contribution to GHG emissions or removals is not material or whose quantification would not be technically feasible or cost effective.

The organization shall explain why certain GHG sources or sinks are excluded from quantification.

4.3.2 Identification of GHG sources and sinks

The organization shall identify and document GHG sources contributing to its direct GHG emissions.

If the organization quantifies GHG removals, the organization shall identify and document GHG sinks contributing to its GHG removals.

The organization should separately document suppliers of imported electricity, heat or steam consumed by the organization.

If the organization quantifies other indirect GHG emissions, the organization should separately identify and document GHG sources contributing to its other indirect GHG emissions.

The organizations shall, as appropriate, categorize identified GHG sources and sinks.

NOTE Examples of GHG source and sink categories can be found in References [4] and [6].

The detail with which sources and sinks are identified and categorized should be consistent with the quantification methodology used.

4.3.3 Selection of quantification methodologies

The organization shall select and use quantification methodologies that will reasonably minimize uncertainty and yield accurate, consistent and reproducible results.

EXAMPLE Quantification methodologies are often prescribed by GHG programmes and can be classified into the following types.

a) Calculation based on
   - GHG activity data multiplied by GHG emission or removal factors,
   - the use of models,
   - facility-specific correlations, and
   - mass balance approach.

b) Measurement, either
   - continuous, or
   - intermittent.

c) Combination of measurement and calculation.

The organization shall explain its selection of quantification methodologies.

The organization shall explain any changes to quantification methodologies previously used by the organization.

4.3.4 Selection and collection of GHG activity data

If GHG activity data are used to quantify GHG emissions and removals, the organization shall select and collect GHG activity data consistent with the requirements of the selected quantification methodology.

4.3.5 Selection or development of GHG emission or removal factors

If GHG activity data are used to quantify GHG emissions and removals, the organization shall select or develop GHG emission and removal factors that

a) are derived from a recognized origin,

b) are appropriate for the GHG source or sink concerned,

c) are current at the time of quantification,

d) take account of quantification uncertainty and are calculated in a manner intended to yield accurate and reproducible results, and

e) are consistent with the intended use of the GHG inventory.

The organization shall explain its selection or development of GHG emission or removal factors, including identification of their origin and appropriateness for the intended use for the GHG inventory.

The organization shall explain any changes to GHG emission or removal factors previously used by the organization and, where appropriate, recalculate the base-year GHG inventory (see 5.3).

4.3.6 Calculation of GHG emissions and removals

The organization shall calculate GHG emissions and removals in accordance with the quantification methodology selected (see 4.3.3).

Where GHG activity data are used to quantify GHG emissions or removals, GHG emissions and removals shall be calculated by multiplying GHG activity data by GHG emission or removal factors.

5 GHG inventory components

5.1 GHG emissions and removals

The organization shall document the following, where quantified in accordance with Clause 4, separately at facility and organization levels:

— direct GHG emissions for each GHG;

— GHG removals;

— energy indirect GHG emissions;

— other indirect GHG emissions;

— direct CO_2 emissions from the combustion of biomass.

The organization should document separately at facility and organization levels other categories of GHG emissions and removals as appropriate.

NOTE 1 Examples of other categories of GHG emissions and removals can be found in References [4] and [6].

The organization shall use tonnes as the unit of measure and shall convert the quantity of each type of GHG to tonnes of CO_2e using appropriate GWPs.

NOTE 2 Annex C includes GWPs produced by the Intergovernmental Panel on Climate Change.

5.2 Organizational activities to reduce GHG emissions or increase GHG removals

5.2.1 Directed actions

The organization may plan and implement directed actions to reduce or prevent GHG emissions or increase GHG removals.

The organization may quantify GHG emission or removal differences attributable to the implementation of directed actions. GHG emission or removal differences resulting from directed actions will usually be reflected in the organization's GHG inventory, but may also result in GHG emission or removal differences outside GHG inventory boundaries.

If quantified, the organization should document its directed actions.

If reported, the organization shall report directed actions and associated GHG emission or removal differences separately and shall describe

a) the directed action,

b) the spatial and temporal boundaries of the directed action,

c) the approach used to quantify GHG emission or removal differences, and

d) the determination and classification of GHG emission or removal differences attributable to directed actions as direct, indirect or other types of GHG emissions or removals.

EXAMPLE Directed actions might include the following types of initiatives:

— energy demand and use management;

— energy efficiency;

— technology or process improvements;

— GHG capture and storage in, typically, a GHG reservoir;

— management of transport and travel demands;

— fuel switching or substitution;

— afforestation.

5.2.2 GHG emission reduction or removal enhancement projects

If the organization reports GHG emission reductions or removal enhancements purchased or developed from GHG projects quantified using methodologies such as that given in ISO 14064-2, the organization shall list such GHG emission reductions or removal enhancements separately from GHG projects.

5.3 Base-year GHG inventory

5.3.1 Selection and establishment of base year

The organization shall establish an historical base year for GHG emissions and removals for comparative purposes or to meet GHG programme requirements or other intended uses of the GHG inventory.

If sufficient information on historical GHG emissions or removals is not available, the organization may use its first GHG inventory period as the base year.

In establishing the base year, the organization

a) shall quantify base-year GHG emissions and removals using data representative of the organization's activity, typically single-year data, a multi-year average or a rolling average,

b) shall select a base year for which verifiable GHG emissions or removals data are available,

c) shall explain the selection of the base year, and

d) shall develop a GHG inventory for the base year consistent with the provisions of this part of ISO 14064.

The organization may change its base year, but shall explain any change to the base year.

5.3.2 Recalculation of GHG inventory

The organization shall develop, apply and document a base-year recalculation procedure to account for

a) changes to operational boundaries,

b) the ownership and control of GHG sources or sinks transferred into or out of organizational boundaries, and

c) changes to GHG quantification methodologies that result in significant changes to quantified GHG emissions or removals.

The organization shall not recalculate its base-year GHG inventory to account for changes in facility production levels, including the closing or opening of facilities.

The organization should document base-year recalculations in subsequent GHG inventories.

5.4 Assessing and reducing uncertainty

The organization should complete and document an uncertainty assessment for GHG emissions and removals, including the uncertainty associated with emission and removal factors.

The organization may apply the principles and methods of Reference [5] in completing the uncertainty assessment.

6 GHG inventory quality management

6.1 GHG information management

6.1.1 The organization shall establish and maintain GHG information management procedures that

a) ensure conformance with the principles of this part of ISO 14064,

b) ensure consistency with the intended use of the GHG inventory,

c) provide routine and consistent checks to ensure accuracy and completeness of the GHG inventory,

d) identify and address errors and omissions, and

e) document and archive relevant GHG inventory records, including information management activities.

6.1.2 The organization's GHG information management procedures should consider the following:

a) identification and review of the responsibility and authority of those responsible for GHG inventory development;

b) identification, implementation and review of appropriate training for members of the inventory development team;

c) identification and review of organizational boundaries;

d) identification and review of GHG sources and sinks;

e) selection and review of quantification methodologies, including GHG activity data and GHG emission and removal factors that are consistent with the intended use of the GHG inventory;

f) a review of the application of quantification methodologies to ensure consistency across multiple facilities;

g) use, maintenance and calibration of measurement equipment (if applicable);

h) development and maintenance of a robust data-collection system;

i) regular accuracy checks;

j) periodic internal audits and technical reviews;

k) a periodic review of opportunities to improve information management processes.

6.2 Document retention and record keeping

The organization shall establish and maintain procedures for document retention and record keeping.

The organization shall retain and maintain documentation supporting the design, development and maintenance of the GHG inventory to enable verification. The documentation, whether in paper, electronic or other format, shall be handled in accordance with the organization's GHG information management procedures for document retention and record keeping.

7 Reporting of GHG

7.1 General

The organization should prepare a GHG report to facilitate GHG inventory verification, participation in a GHG programme, or to inform external or internal users. GHG reports should be complete, consistent, accurate, relevant and transparent. The organization should determine the content, structure, public availability and methods of dissemination of GHG reports, based on requirements of the applicable GHG programme, internal reporting needs and the needs of intended users of the report.

If the organization makes a public GHG assertion claiming conformance to this part of ISO 14064, the organization shall make available to the public a GHG report prepared in accordance with this part of ISO 14064 or an independent third-party verification statement related to the GHG assertion. If the organization's GHG assertion has been independently verified, the verification statement shall be made available to intended users.

7.2 Planning the GHG report

The organization should consider and document the following in planning its GHG report:

a) purpose and objectives of the report in the context of the organization’s GHG policies, strategies or programmes and applicable GHG programmes;

b) intended use and intended users of the report;

c) overall and specific responsibilities for preparing and producing the report;

d) frequency of the report;

e) period for which the report is valid;

f) report format;

g) data and information to be included in the report;

h) policy on availability and methods of dissemination of the report.

7.3 GHG report content

7.3.1 The organization’s GHG report shall describe the organization’s GHG inventory and shall include the following:

a) description of the reporting organization;

b) person responsible;

c) reporting period covered;

d) documentation of organizational boundaries (4.1);

e) direct GHG emissions, quantified separately for each GHG, in tonnes of CO_2e (4.2.2);

f) a description of how CO_2 emissions from the combustion of biomass are treated in the GHG inventory (4.2.2);

g) if quantified, GHG removals, quantified in tonnes of CO_2e (4.2.2);

h) explanation for the exclusion of any GHG sources or sinks from the quantification (4.3.1);

i) energy indirect GHG emissions associated with the generation of imported electricity, heat or steam, quantified separately in tonnes of CO_2e (4.2.3);

j) the historical base year selected and the base-year GHG inventory (5.3.1);

k) explanation of any change to the base year or other historical GHG data, and any recalculation of the base year or other historical GHG inventory (5.3.2);

l) reference to, or description of, quantification methodologies including reasons for their selection (4.3.3);

m) explanation of any change to quantification methodologies previously used (4.3.3);

n) reference to, or documentation of, GHG emission or removal factors used (4.3.5);

o) description of the impact of uncertainties on the accuracy of the GHG emissions and removals data (5.4);

p) a statement that the GHG report has been prepared in accordance with this part of ISO 14064;

q) a statement describing whether the GHG inventory, report or assertion has been verified, including the type of verification and level of assurance achieved.

7.3.2 The organization should consider including in the GHG report:

a) a description of the organization's GHG policies, strategies or programmes;

b) if quantified, CO_2 emissions from the combustion of biomass, quantified separately in tonnes of CO_2e;

c) if appropriate, description of directed actions and attributable GHG emission or removal differences, including those occurring outside organizational boundaries, quantified in tonnes of CO_2e (5.2.1);

d) if appropriate, purchased or developed GHG emission reductions and removal enhancements from GHG emission reduction and removal enhancement projects, quantified in tonnes of CO_2e (5.2.2);

e) as appropriate, a description of applicable GHG programme requirements;

f) GHG emissions or removals disaggregated by the facility;

g) if quantified, other indirect GHG emissions, quantified in tonnes of CO_2e (4.2.4);

h) uncertainty assessment description and results, including measures to manage or reduce uncertainties (5.4);

i) description and presentation of additional indicators, such as efficiency or GHG emission intensity (emissions per unit of production) ratios (see Reference [4]);

j) assessment of performance against relevant internal and/or external benchmarks, as appropriate;

k) description of GHG information management and monitoring procedures (6.1).

8 Organization's role in verification activities

8.1 General

The overall aim of verification is to review impartially and objectively the reported GHG emissions and removals or GHG assertion against the requirements of ISO 14064-3. On a regular basis, the organization should

a) prepare and plan for verification in accordance with 8.2 and 8.3 respectively,

b) determine an appropriate level of assurance based on the requirements of the intended user of the GHG inventory, taking into account relevant requirements of applicable programmes, and

c) conduct verification consistent with the needs of the intended user and the principles and requirements of ISO 14064-3.

8.2 Preparing for verification

In preparing for verification, the organization should

a) develop a verification scope and objectives,

b) review, as applicable, requirements of this part of ISO 14064,

c) review applicable organizational or GHG programme verification requirements,

d) determine the level of assurance required,

e) agree to verification objectives, scope, materiality and criteria with the verifier,

f) ensure that the roles and responsibilities of appropriate staff are clearly defined and communicated,

g) ensure that the organization's GHG information, data and records are complete and accessible,

h) ensure that the verifier has appropriate competence and qualifications, and

i) consider the content of the verification statement.

8.3 Verification management

8.3.1 Verification plan for the organization

The organization should develop and implement a verification plan that includes the following:

a) the verification process, scope, criteria, level of assurance and verification activities as agreed with the verifier;

b) roles and responsibilities for implementing and maintaining the plan;

c) resources necessary to achieve planned outcomes;

d) data sampling and custody procedures;

e) maintenance of necessary documentation and records;

f) processes for monitoring and reviewing the plan;

g) appointment of competent verifiers.

8.3.2 Verification process

The organization's verification activities should address

a) agreement with the scope, objectives, criteria and level of assurance with the verifier,

b) assessment of GHG data sampling and custody procedures,

c) internal review of the GHG verification statement against criteria, and

d) verification reporting.

8.3.3 Competence of verifiers

The organization should ensure that all personnel involved in the verification process

a) are aware of GHG management issues,

b) understand the operations and processes that they verify,

c) have the necessary technical expertise to support the verification process, and

d) are familiar with the contents and intent of this part of ISO 14064.

The organization should ensure that the verifier has appropriate competences as defined in ISO 14065.

The organization should select verification personnel who are administratively independent of the operations subject to verification, to ensure objectivity and impartiality in the verification process.

8.3.4 Verification statement

The organization should request from the verifier a statement that includes, as a minimum

a) a description of the objectives, scope and criteria of the verification activities,

b) a description of the level of assurance, and

c) the verifier's conclusion indicating any qualification or limitations.

NOTE Examples of verification statements for reasonable and limited levels of assurance can be found in Annex A of ISO 14064-3:2006.

Annex A
(informative)

Consolidating facility-level data to the organization level

A.1 General

In developing its GHG quantification and reporting system, an organization should ensure that the data system is capable of meeting a range of reporting requirements. GHG data should be recorded and quantified by source, sink and type at least to the facility level. Such data should be retained in its disaggregated form to provide maximum flexibility in meeting a range of reporting requirements. Consolidation of the information can then be carried out as required.

If the GHG emissions and removals are quantified at the facility level (see References [5] and [6]), and if the purpose and GHG programme requirements of the organization's GHG reporting are known, one of the two approaches outlined in A.2 and A.3 should be selected to guide and assist in the consolidation of facility data to the organization level.

Where possible, organizations should follow the organizational boundaries already in place for their financial accounting, provided these are explicitly explained and followed consistently. When applying these concepts, the underlying assumption of “substance over form” should be followed. That is, GHG emissions and removals should be quantified and reported in accordance with the organization's substance and economic reality and not merely its legal form.

A.2 Consolidation based on control

Under the control approach, an organization accounts for 100 % of the GHG emissions or removals from operations over which it has control. It does not account for GHG emissions or removals from operations in which it owns an interest but has no control. Control may be defined in either financial or operational terms. When using the control approach to consolidate GHG emissions or removals, organizations may choose between either the operational control or financial control criteria.

An organization has financial control over the operation if it has the ability to direct the financial and operating policies of the operation with a view to gain economic benefits from its activities. An organization has operational control over an operation if it or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation level.

A.3 Consolidation based on equity share

Equity share is the percentage of economic interest in, or benefit derived from, a facility. This consolidation approach increases the usability of GHG information for different users, and aims to mirror as far as possible the approach adopted by financial accounting and reporting standards. The equity share approach can be particularly useful for multinational companies with operations in a number of different jurisdictions aiming to determine their GHG “footprint”.

Consolidating to the organizational level based on equity share requires establishing the ownership percentage of each facility, and accounting for that percentage of GHG emissions or removals from respective facilities, including using production share agreements.

Organizations are encouraged to refer to Reference [4] for additional guidance in applying consolidation approaches.

Annex B
(informative)

Examples of other indirect greenhouse gas emissions

Examples of an organization's activities that might result in indirect GHG emissions, other than GHG emissions from the generation of imported electricity, heat or steam consumed by the organization, can include, but are not limited to, the following:

— commuting and business travel by employees;

— transportation of an organization's products, materials, people or waste by another organization;

— outsourced activities, contract manufacturing and franchises;

— GHG emissions from waste generated by the organization but managed by another organization;

— GHG emissions from the use and end-of-life phases of the organization's products and services;

— GHG emissions arising from the production and distribution of energy products, other than electricity, steam and heat, consumed by the organization;

— GHG emissions from the production of purchased raw or primary materials.

Annex C
(informative)

Greenhouse gas global warming potentials

Table C.1 provides various GWPs for a 100-year time horizon published by the Intergovernmental Panel on Climate Change (IPCC) in their 1996 reporting guidelines for national GHG gas inventories[6].

Table C.1 — GHG global warming potentials

Gas	Chemical formula	Global warming potential (from Reference [6])
Carbon dioxide	CO_2	1
Methane	CH_4	21
Nitrous oxide	N_2O	310
Hydrofluorocarbons (HFCs)		
HFC-23	CHF_3	11 700
HFC-32	CH_2F_3	650
HFC-41	CH_3F	150
HFC-43-10mee	$C_5H_2F_{10}$	1 300
HFC-125	C_2HF_5	2 800
HFC-134	$C_2H_2F_4$ (CHF_2CHF_2)	1 000
HFC-134a	$C_2H_2F_4$ (CH_2FCF_3)	1 300
HFC-143	$C_2H_3F_3$ (CHF_2CH_2F)	300
HFC-143a	$C_2H_3F_3$ (CF_3CH_3)	3 800
HFC-152a	$C_2H_4F_2$ (CH_3CHF_2)	140
HFC-227ea	C_3HF_7	2 900
HFC-236fa	$C_3H_2F_6$	6 300
HFC 245ca	$C_3H_3F_5$	560
Hydrofluoroethers (HFEs)		
HFE-7100	$C_4F_9OCH_3$	500
HFE-7200	$C_4F_9OC_2H_5$	100
Perfluorocarbons (PFCs)		
Perfluoromethane (tetrafluoromethane)	CF_4	6 500
Perfluoroethane (hexafluoroethane)	C_2F_6	9 200
Perfluoropropane	C_3F_8	7 000
Perfluorobutane	C_4F_{10}	7 000
Perfluorocyclobutane	c-C_4F_8	8 700
Perfluoropentane	C_5F_{12}	7 500
Perfluorohexane	C_6F_{14}	7 400
Sulfur hexafluoride	SF_6	23 900

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[3] ISO 14065:—[1)], *Greenhouse gases — Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition*

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1) To be published.

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3) Available from http://www.ipcc.ch.