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Carbon dioxide capture, transportation and geological storage — Vocabulary —

Part 1:
Cross-cutting terms

Captage, transport et stockage géologique du dioxyde de carbone — Vocabulaire

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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 27917-1 was prepared by Technical Committee ISO/TC 265, *Carbon dioxide capture, transportation and geological storage*.

ISO 27917 consists of the following parts, under the general title *Carbon dioxide capture, transportation and geological storage — Vocabulary*:

— *Part 1: Cross-cutting terms*

— *Part 2: Specific terms and definitions relating to capture*

— *Part 3: Specific terms and definitions relating to transportation*

— *Part 4: Specific terms and definitions relating to geological storage*

— *Part 5: Specific terms and definitions relating to quantification and verification*

— *Part 6: Specific terms and definitions relating to Carbon Dioxide Storage using enhanced oil recovery.*

Introduction

The objectives of this International standard ISO 27917 are the following:

— to provide a comprehensive list of terms and their definitions for carbon dioxide capture, transportation and geological storage including through EOR operation in order to facilitate communication among:

— Experts involved in the development of ISO standards on carbon dioxide capture, transportation and geological storage.

— Other carbon dioxide capture, transportation and geological storage stakeholders

— To provide the basis for common understanding for all future ISO standards for carbon dioxide capture, transportation and geological storage.

The intention is to revise ISO 27917-1 within two years after publication in order to ensure consistency with terms and definitions across ISO/TC 265 standards.

This standard is split into several parts as follows:

— Part 1: Cross-cutting terms

— Part 2: Specific terms and definitions relating to capture

— Part 3: Specific terms and definitions relating to transportation

— Part 4: Specific terms and definitions relating to geological storage

— Part 5: Specific terms and definitions relating to quantification and verification

— Part 6: Specific terms and definitions relating to Carbon Dioxide Storage using enhanced oil recovery.

This present document covers only cross-cutting terms (part 1).

Carbon dioxide capture, transportation and geological storage — Vocabulary —

Part 1:
Cross-cutting terms

1 Scope

This standard defines a list of cross-cutting terms commonly used in the field of carbon dioxide capture, transportation and geological storage including through EOR operation.

The terms are classified as follows:

— General terms and definitions relating to carbon dioxide capture, transportation and storage

— General terms and definitions relating to CO_2

— General terms and definitions relating to monitoring and measuring performance in carbon dioxide capture, transportation and geological storage

— General terms and definitions relating to risk

— General terms and definitions relating to relationship with stakeholders

A list of the main acronyms used is given in annex A.

2 General terms and definitions relating to carbon dioxide capture, transportation and storage

2.1
carbon dioxide capture and storage
CCS
process consisting of the separation of CO_2 from industrial and energy-related sources, transportation and injection into a geological formation, resulting in long term isolation from the atmosphere

Note 1 to entry: CCS is often referred to as Carbon Capture and Storage. This terminology is not encouraged because it is inaccurate: the objective is the capture of carbon dioxide and not the capture of carbon. Tree plantation is another form of carbon capture that does not describe precisely the physical process of removing CO_2 from industrial emission sources.

Note 2 to entry: The term “sequestration” is also used alternatively to “storage”. The term “storage” is preferred since “sequestration” is more generic and can also refer to biological processes (absorption of carbon by living organisms).

Note 3 to entry: Long-term means the minimum period necessary for CO_2 geological storage to be considered an effective and environmentally safe climate change mitigation option.

Note 4 to entry: The term carbon dioxide capture, utilization (or use) and storage (CCUS) includes the concept that isolation from the atmosphere could be associated with a beneficial outcome. CCUS is embodied within the definition of CCS to the extent that long term isolation of the CO_2 occurs through storage within geological formations. CCU is Carbon Capture and utilization (or use) without storage within geological formations.

Note 5 to entry: CCS should also ensure long term isolation of CO_2 from oceans, lakes, potable water supplies and other natural resources.

2.2
CCS project life cycle
entirety of phases of a CCS project from concept through the post-closure

Note 1 to entry: It includes mainly concept, design, obtaining permit, construction, operation, monitoring, measurement and verification, decommissioning, closure and post-closure (see annex B).

2.3
life cycle assessment
LCA
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a CCS project or a component part throughout its life cycle

[SOURCE: adapted from ISO 14040:2006(en), 3.2]

Note 1 to entry: Boundaries of the assessment include all equipment and processes necessary to evaluate a CCS project or component part. The main input and output flows may include raw materials, process gases, electricity, fossil fuels, water, CO_2, emission in air and water, solid and liquid waste, co-products, etc.

2.4
value chain
entire sequence of activities or parties that provide or receive value in the form of products or services

[SOURCE: ISO 26000:2010(en)]

2.5
CCS energy consumption
total energy used for the development, operation and decommissioning of a CCS project

Note 1 to entry: It could be expressed in GJ.

2.6
intermittency
lack of continuity in operation, as measured by the frequency or extent to which a process or installation is stopped or unavailable

Note 1 to entry: Intermittency includes variable CO_2 flows among project components.

2.7
closure period
period between the cessation of CO_2 injection and the demonstration of compliance with the criteria for site closure

2.8
post–closure period
period that begins with the demonstration of compliance with the criteria for site closure

Note 1 to entry: In some countries, demonstration of compliance may need approval from a third party.

2.9
geological storage complex
subsurface geological system extending vertically to comprise storage unit(s) and primary and secondary seals, and extending laterally to the defined limits of the CO_2 storage project

Note 1 to entry: Limits can be defined by natural geological boundaries, regulation or legal rights.

3 General terms and definitions relating to CO_2

3.1
supercritical CO_2
CO_2 at pressure greater than the critical pressure and at temperature greater than the critical temperature

3.2
dense phase CO_2
CO_2 in its liquid or supercritical phases

Note 1 to entry: Compression and transport of dense phase CO_2 are commonly achieved using pumps. Compression and transport at lower densities are commonly achieved with turbo-compressors.

Note 2 to entry: Not all supercritical CO_2 is in a dense phase and not all dense phase CO_2 is supercritical.

Note 3 to entry: Figure 1 illustrates pure CO_2 phase diagram and density plots, calculated according to Span and Wagner (1996), and plotted as a function of temperature and pressure.

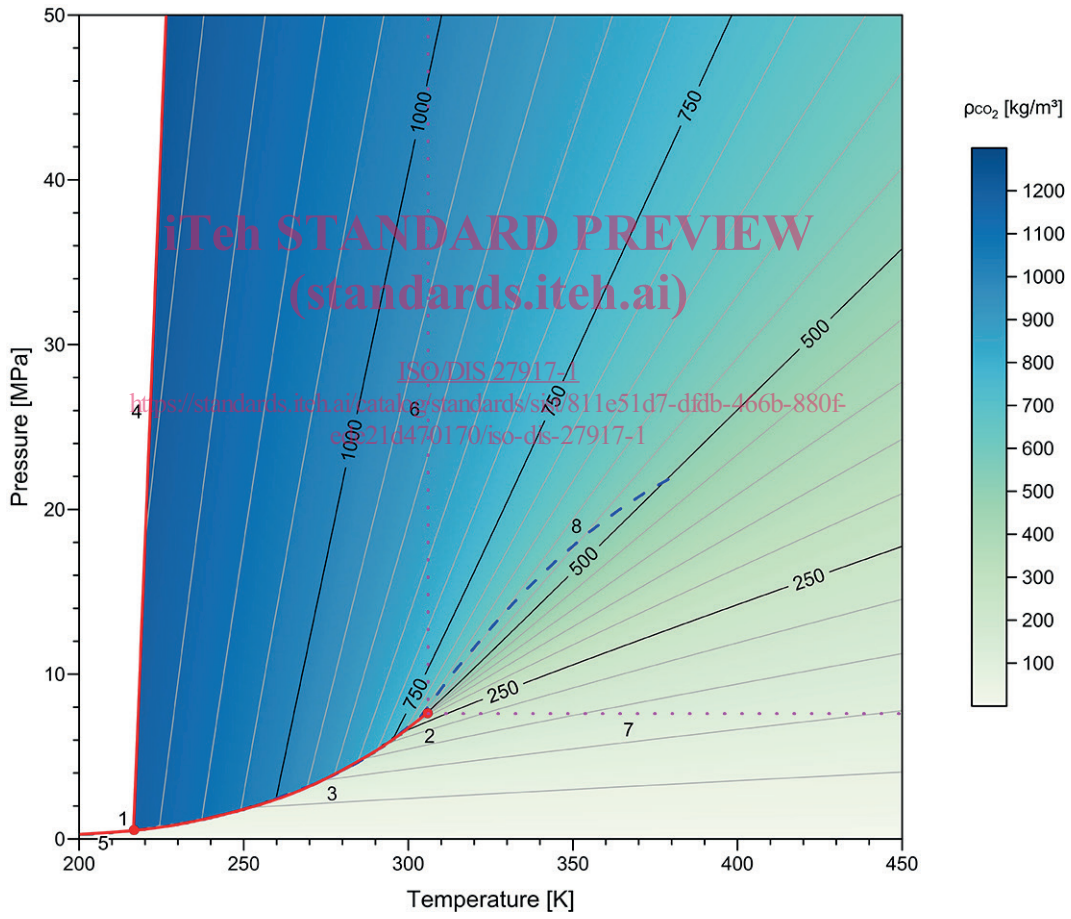

Figure 1 — Pure CO2 phase diagram and density plots

Key

1 triple point
2 critical point
3 liquid-gas phase boundary
4 solid-(dense) fluid phase boundary
5 solid-(gaseous) fluid phase boundary
6 critical temperature
7 critical pressure
8 lower operation limit for radial pumps,

Line number 8 is shown as an example illustrating typical operation limits specific to individual pumps, according to Schwarz and Ruf, in Fischedick et al. eds. (2015) CO_2: Abtrennung, Speicherung, Nutzung. Chapter 8.4.2 CO_2 Verdichtung. Springer, Berlin, Heidelberg, 855 p.

Fluid CO_2 in the p-T-range between lines 3, 4 and 6 is often named liquid CO_2.

Fluid CO_2 in the p-T-range between lines 3, 5 and 7 is often named gaseous CO_2.

Fluid CO_2 in the p-T-range between lines 6 and 7 is often named supercritical CO_2.

Solid CO_2 in the p-T-range between lines 4 and 5 is often named dry ice.

Fluid CO_2 in the p-T-range above of lines 3 and 8 is often named dense phase CO_2.

In thermodynamic equilibrium, liquid and gaseous CO_2 do only coexist at p-T-values specified by line 3 between points 1 and 2.

3.3
critical point
highest temperature and pressure at which a pure substance (e.g. CO_2) can exist as a gas and a liquid in equilibrium

Note 1 to entry: For a multicomponent fluid mixture of a given composition, the critical point is the intersection of the bubble and the dew point curves.

3.4
critical pressure
vapour pressure at the critical temperature

Note 1 to entry: According to Span and Wagner 1996, the critical pressure for pure CO_2 is expressed in absolute pressure as 7,3773 MPa (gauge pressure 7,28 MPag).

3.5
critical temperature
temperature above which liquid cannot be formed simply by increasing the pressure

Note 1 to entry: According to Span and Wagner 1996, the critical temperature for pure CO_2 is 304,1282 K.

3.6
anthropogenic CO_2 emission
total mass of CO_2 released to the atmosphere or surface water bodies from anthropogenic sources over a specified period of time

[SOURCE: adapted from ISO 14064-2:2006, 2.5]

3.7
CO_2 equivalent
unit for comparing the radiative forcing of a GHG to carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential.

[SOURCE: ISO 14064-2:2006, 2.21]

3.8
global warming potential
GWP
factor describing the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a specified given period of time

[SOURCE: adapted from ISO 14064-2:2006(en), 2.20]

3.9
CO_2 emission reduction
calculated net decrease of CO_2 emissions between a baseline scenario and the CCS project output

Note 1 to entry: In most cases, a CO_2 emission reduction may be referred to as "CO_2 avoided".CO_2 avoided may also refer to CO_2 removals from the atmosphere.

[SOURCE: ISO 14064-2:2006 modified, (2.7)]

3.10
abatement
reduction in the amount, degree or intensity of emissions of CO_2 or other pollutants

[SOURCE: adapted from IPCC]

3.11
CO_2 stream
stream consisting overwhelmingly of carbon dioxide

Note 1 to entry: the CO_2 stream typically includes impurities and may include substances added to the stream to improve performance of CCS and/or to enable CO_2 detection.

3.12
CO_2 stream phase state
thermodynamic state of CO_2 stream, which is a function of the composition of the stream (the chemical characteristics and proportions of the components), and the physical state of the stream (temperature, pressure and volume)

3.13
impurities
non-CO_2 substances that are part of the CO_2 stream that may be derived from the source materials or the capture process, or added as a result of commingling for transportation, or released or formed as a result of sub-surface storage and/or leakage of CO_2

Note 1 to entry: As a subset of impurities, contaminants are non-CO_2 substances whose presence in the CO_2 stream is generally unwanted.

Note 2 to entry: As a subset of impurities, additives are substances added to the stream for the purposes of managing its physical or chemical behaviour (e.g. hydrate and corrosion inhibitors), for or from interaction with equipment (e.g. lubricants), and to track its distribution in the subsurface after injection (geochemical tracers).

3.14
pressure limit
pre-defined extrema of pressure for safe and effective operation of components of CCS project