STRATEGIC BUSINESS PLAN – ISO/TC 265

Executive summary

The current CO_2 concentration in the atmosphere is around 424 ppm.[1] Pre-industrial levels of atmospheric CO_2 were approximately 280 ppm. The increasing concentration of greenhouse gases (GHGs) in the atmosphere is generally agreed to be the cause of an increasing global mean temperature.

Carbon Capture and Storage (CCS) is a key technology to reduce emissions of CO_2 into the atmosphere and, thus, help control global warming. In 2015, parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to hold "the increase in the global average temperature to well below 2 °C above pre-industrial levels" and, furthermore, to pursue efforts "to limit the temperature increase to 1.5 °C". The Agreement entered into force in November 2016. Analysis by the International Energy Agency (IEA) suggests CCS could avoid the release of 6.1 Gt CO_2 per annum to the atmosphere in 2050 and contribute about 12% of the cumulative emissions reductions required to achieve the 2 °C target through 2050.[2] The overall cost of a global climate mitigation strategy without CCS is higher than a strategy with CCS. According to the Intergovernmental Panel on Climate Change (IPCC) Working Group III Report on Climate Mitigation for the Fifth Assessment Report, the cost of achieving 450 ppm scenario without CCS represented a 138% increase, compared with a default case which included CCS.[3] By July 2024, 50 large-scale CCS projects were operating and a further 44 were in construction that were expected to begin operating soon.[4] Completion of the projects in construction will bring total global CO_2 capture capacity to over 100 Mtpa CO_2.

The intent of ISO/TC 265 is to prepare International Standards for the design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the field of carbon dioxide capture, transportation, and safe, long-term storage. The focus is on CO_2 being emitted from industrial sources or captured from the atmosphere. Existing standards will be utilized where possible.

The aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade. Many aspects of the newly evolving field of CCS are internationally diverse, cross intra- and international borders, and have the potential to impact both current and future generations. ISO standards for CCS technology will, therefore, help to provide a common basis for commercial and business transactions (e.g., trading of emissions allowances) and encourage safe, effective use of CCS. Expected benefits of standardization include:

- Helping facilitate the deployment, integration and interoperability of procedures, systems, and technologies needed to safely implement and operate CCS projects.

1 https://climate.nasa.gov/vital-signs/carbon-dioxide/ (accessed January 2025)
2 International Energy Agency (2016). *20 Years of Carbon Capture and Storage, Accelerating Future Deployment.* OECD/IEA, France.
3 IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
4 Global CCS Institute, *The Global Status of CCS: 2024,* Canberra, Australia.

- Enabling knowledge sharing, innovation, cooperation and coordination.
- Achieving greater consistency across multiple interests and different abilities of professional disciplines, sectors, and levels of administrative responsibility within the national and transnational context.
- Help in harmonizing regional efforts and cross-border CCS value chains.
- Increasing preparedness, continuity management, culture and best practices within governments and organizations working in the field of CCS.
- Increased awareness and enhanced capabilities amongst interested parties and stakeholders to share information and communicate.
- Reducing risks and adverse consequences of accidental, intentional and natural events.
- Helping achieve public acceptance of CCS as a safe and reliable climate change mitigation strategy.

There are currently 28 participating member countries, 18 observing members, and 9 liaison organizations involved in ISO/TC 265. Six working groups are currently active in the development of the International Standards. Working groups are led by participating member countries. The scope of work includes not only elements that require standardization now, but are also forward looking and include elements that will require standardization in the future. Detailed strategies and priorities have been established for each of the working groups and the business plan will be updated as work progresses.

1 Introduction

1.1 ISO technical committees and business planning

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important activity. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

This business plan addresses the work of the ISO/TC 265 committee for the development of International Standards for the developing and dynamic fields of carbon dioxide capture, transportation and safe, long-term storage. The approved scope of work adopted by the technical committee is summarized as follows:

Standardization of design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the field of carbon dioxide capture, transportation, and geological storage (CCS).

The focus of the committee's work is on the capture, transport and safe, long-term storage of CO_2 from the atmosphere, or from anthropogenic CO_2 generated from industrial sources, with the purpose of reducing the climate change impact of CO_2 emissions. Example industries include power generation, cement plants, gas plants, petroleum refineries, hydrogen production, chemical and fertilizer productions, waste-to-energy and iron and steel plants. The work of the technical committee also includes CCS in the shipping sector, but does not encompass other mobile emitters of CO_2.

The term "carbon dioxide capture, transportation, and storage", or CCS, is used broadly to describe a range of processes that mitigate emissions of greenhouse gases (GHGs), where CO_2 is a major component of the emissions. Thus, CCS may have a different meaning in other contexts. The ISO/TC 265 technical committee has adopted a working title that reflects the committee's focus on mitigation of CO_2 emissions. An Annex has been added to clarify the meaning of the term GHG as applied to the ISO/TC 265 work.

- The addition of the Annex represents the "limits" or scope boundary by which ISO/TC 265 will operate, but is not a mandate nor does it provide definitions. It merely sets the upper or outer limit that a WG may go in developing a standard, and anything short of; or within the confines of the Annex is acceptable (e.g., individual working groups using or defining terms such as emissions or losses based on their specific use)

- The capture, compression, transport, and storage of CO_2 involves a number of distinct process steps. To acknowledge this, point #2 of the Annex suggests both 'shall' and 'should' may be required for quantifying CO_2 at various stages in the process.

- Regarding point #3, reporting should not be interpreted to indicate that GHGs other than CO2 should not be monitored, measured, validated or verified. TC 265 experts are free to provide guidance (at least in a non-normative manner) as to how GHGs other than CO_2 may be measured, monitored, verified, and how this information may be documented.

ISO/TC 265 is not developed in isolation and should be read as complimentary to numerous other ISO GHG related activity as outlined in Section 5.2. For efficiency, the acronym CCS will be used throughout this document to describe the technical committee's work.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade. Many aspects of the newly evolving field of CCS are internationally diverse, cross intra-and international borders and have the potential to impact both current and future generations. ISO standards for CCS technology will, therefore, help to provide a common basis for commercial transactions (e.g., trading of emissions allowances) and encourage safe, effective use of CCS.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 169 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2 Business Environment of the ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC. They may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards.

The global scientific community working in the field of climate change generally acknowledges that the emission rate of greenhouse gases (GHGs), such as CO_2, has to be reduced if global warming is to be controlled. In December 2015, countries gathered in Paris (COP21) under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC). 196 Parties agreed to hold "the increase in the global average temperature to well below 2 °C above pre-industrial levels" and, furthermore, to pursue efforts "to limit the temperature increase to 1.5 °C above pre-industrial levels." In recent COP meetings, world leaders have stressed the need to limit global warming to 1.5 °C by the end of this century.

It is generally agreed that no single technology can deliver the emissions reductions needed to achieve this goal. The International Energy Agency (IEA) estimates that emissions must be reduced by 42 Gt CO_2 per year by 2050 (relative to a business-as-usual scenario) in order to limit temperature increases to 2 °C and that CCS would contribute about 6.1 Gt CO_2 of the total in a minimum cost mitigation scenario.[1]

The overall cost of a global climate mitigation strategy without CCS is higher than a strategy with CCS. According to the Intergovernmental Panel on Climate Change (IPCC) Working Group III Report on Climate Change Mitigation - the Fifth Assessment Report, the cost of achieving a 450 ppm atmospheric scenario without CCS represented a 138 percent increase compared with a default case which included CCS.[2]

The Global CCS Institute (GCCSI) has identified 50 large-scale CCS projects operating as of July 2024, with a further 44 in construction that are expected to begin operating by 2027; that will bring the total capture capacity to over 100 million tonnes of CO_2 per year.[3] In addition to these operating (or near to operating) projects, there are 247 projects in advanced stages of planning.

CCS projects to date have been mainly in developed countries. IEA analysis suggests, however, that deployment of CCS in rapidly growing (i.e., developing) countries will be critical to mitigating global CO_2 emissions. Development of government and industry capacity to undertake CCS in these countries has been supported by numerous international organizations (e.g., World Bank, Asian Development Bank, Global CCS Institute), and national governments (e.g., Australia, Norway, United Kingdom, United States). For example, development of the "Roadmap for CCS Demonstration and Deployment in the People's Republic of China" was supported by the ADB. This roadmap lays out a pathway for China that begins with near-term demonstrations of CCS in relatively low-cost applications and leads to wide-spread application of CCS post-2030. Developing the business case for a CCS project is complex and challenging because adding CCS to existing processes increases capital costs as well as operating and maintenance costs and requires coordination amongst multiple parties in the CCS chain. As another example, development of the

[1] International Energy Agency (2016). 20 Years of Carbon Capture and Storage, Accelerating Future Deployment. OECD/IEA, France.

[2] IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[3] Global CCS Institute, The Global Status of CCS: 2024, Canberra, Australia.

[4] International Institute for Applied Systems Analysis. Evaluating Process-Based Integrated Assessment Models of Climate Change Mitigation -May 2017

[5] Carbon Capture, Utilization, and Storage: Handbook for Policymakers (2024).

open access "CCUS Handbook for Policymakers" was supported by multiple U.S. Government Agencies. The Handbook aims to support policymakers in emerging economies that are considering or actively pursuing any part of the CCUS value chain.[5]

While CCS can be commercially competitive when compared to large-scale technologies that reduce or avoid CO_2 emissions, CCS is often not considered due to:

- Perceptions regarding the early stage of the technology's deployment and the associated technology risk
- Insufficient incentives for abatement of CO_2 emissions
- Where they exist, market prices for CO_2 that are too low (or uncertain) to support the investment
- Government policy and funding support mechanisms that do not treat CCS equivalent to other low-carbon technologies
- The effects of political, legal and regulatory uncertainty.

The IEA,[1] the GCCSI[3] and the IIASA[4] provide comprehensive analyses of the need to implement CCS as a climate change mitigation strategy, the current status of the technology, and the challenge associated with its implementation. These assessments note that the development of International Standards will support the implementation and safe operation of CCS. Standards will help motivate positive policy development by governments and regulating bodies, as well as reduce barriers to funding of CCS projects.

This in turn will motivate industry to undertake CCS demonstration projects, and subsequently lead to the development of an experience base that will drive innovation and ultimately reduce capital and operating costs.

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC:

In Section 2.1, the IEA, the GCCSI and the IIASA were identified as having completed comprehensive analyses that identify the significant role CCS could play in achieving CO_2 emission reductions.

These works provide broad and deep quantitative indicators of the business environment supporting CCS as a technology that must be implemented. Given the accessibility of these references, a summary is not provided here given the volume of work that has been completed. Interested readers are encouraged to follow-up with the references provided.

3 Benefits expected from the work of the ISO/TC

The benefits expected from the work of ISO/TC 265 include helping enable the implementation of CCS as a mitigation strategy for global warming by:

- Facilitating the deployment, integration and interoperability of procedures, systems, and technologies needed to safely implement and operate CCS projects
- Enabling knowledge sharing, innovation, cooperation and coordination
- Achieving greater consistency across multiple interests and different abilities of professional disciplines, sectors, and levels of administrative responsibility within national and transnational context
- Helping to harmonize regional efforts and cross-border CCS value chains
- Increasing preparedness, continuity management, culture and best practices within governments and organizations working in the field
- Increased awareness and enhanced capabilities amongst interested parties and stakeholders to share information and communicate
- Reducing risks and adverse consequences of accidental, intentional and natural events
- Helping achieve public acceptance of CCS as a safe and reliable climate change mitigation strategy

4 Representation and participation in the ISO/TC

4.1 Membership

ISO/TC 265 Membership

4.2 Analysis of the participation

P- and O-members of ISO/TC 265 reflect a meaningful global representation of developed and developing countries. Each of the members has a strong stakeholder interest in the development of standards for CCS due to one or more of the following reasons:

- A demonstrated commitment to reducing the impact of CO_2 emissions
- Having a strong reliance on hydrocarbons (e.g., coal, natural gas, etc.) as a basis for power generation and industrial manufacturing
- The production and export of hydrocarbons provide significant revenue to a country's economy
- Having a strong reliance on heavy emitting industries, such as cement, steel and others.
- Having expertise and experience with aspects of CCS

While the importance of CCS as a climate change mitigation strategy is widely acknowledged, the relatively low number of countries and organizations actively participating in the development of international standards is a challenge. More awareness about the benefits of CCS in achieving emission reduction goals will encourage broader engagement in CCS standardization activities. It is expected that additional countries will become P-members of ISO/TC 265 as the work progresses.

Countries with high per capita GHG emissions are especially encouraged to become P- members, and the leadership of ISO/TC 265 continually encourages O-members to become P-members. Liaison members with a global membership base are communicating to their members the importance of the work of ISO/TC 265 and encouraging participation in the work of developing an International Standard for CCS.

Funding for work and travel associated with developing an International Standard is a major issue for many members and can limit active participation. Countries and organizations may not have the necessary resources to actively participate in CCS standardization efforts, especially when they have competing priorities or limited resources. Some funding limitations have been mitigated by the ability to participate remotely in technical panels, working group meetings and plenary meetings.

5 Objectives of the ISO/TC and strategies for their achievement

5.1 Defined objective of the ISO/TC

The objective for ISO/TC 265 is to prepare standards for the design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the field of carbon dioxide capture, transportation, and safe, long-term storage.

The intent is that the International Standards will include all aspects related to: the capturing of CO_2 from industrial sources to prevent it from entering the atmosphere, or otherwise removing it from the atmosphere; transporting it; storing it in suitable safe, long-term storage to limit its global warming effects.

In due course, numerous variations of carbon capture and storage will emerge and may provide alternative material decarbonization opportunities. At present, excluded from the work of the ISO/TC 265 will be:

- Storage of CO_2 by direct ocean emplacement
- Industrial uses of CO_2 not related to CCS
- Capture and storage by forest and forest products
- Legal liability and permitting

5.2 Identified strategies to achieve the ISO/TC's defined objectives.

A Chair's Advisory Group (CAG) has been established with a mandate to advise the ISO/TC 265 Chair by recommending policy and helping coordinate the activities of the Technical Committee. All Participating Members are entitled to appoint one representative to the CAG. See the CAG Terms of Reference for details on this Group.

ISO/TC 265 has also decided that the committee would initially not have sub-committees. Rather, work will be completed within Working Groups that will report directly to the Technical Committee. Seven working groups (WG) have been established, with six still active as of January 2025:

1. *Capture: Convened by Japan*
2. *Transportation: Convened by Germany*
3. *Storage: Convened by Canada**
4. *Quantification and Verification: Convened by China* (disbanded in 2020)*
5. *Cross Cutting Issues: Convened by the United States**
6. *CO_2-EOR: Convened by the United States**
7. *Transportation of CO_2 by ship: Convened by Norway*

*Note: WGs 2, 3, 4, 5, 6 had informal 'Co-Convenors' to provide support to the Convenors rather than provide capacity building as would be the case in a twinning arrangement. In keeping with ISO/TMB Resolution 23/18, these roles are no longer part of the ISO/TC 265 structure.

Each working group has a secretariat that comes from the P-members convening a WG. The names and number of working groups may be changed by resolution.

Each of the active WGs are responsible for establishing strategies and priorities for delivering on the objectives of this ISO/TC, and NPs (New Work Items Proposals) have been developed and approved for WGs 1 to 7.

The ISO/TC 265 committee aspires to meet, at a minimum, annually, with intermediate action items handled electronically between meetings. In the event an annual in-person or hybrid meeting is not possible, the TC 265 Secretariat shall endeavor to host a virtual plenary on-line. Working groups will typically meet more often and will utilize teleconferencing and e-mail as the main method of communication and the dissemination of information.

In general, ISO/TC 265 will avoid the duplication of standards through close coordination with ISO/CEN committees and other NSB's, and the use of existing standards is being encouraged. For example, many published pipeline standards already define the parameters to be understood for the transportation of CO_2. In addition, liaisons with other ISO/CEN committees will be utilized as appropriate, and current liaisons are:

- ISO/TC 8 Ships and marine technology
- ISO/TC 8/SC 25 Maritime GHG reduction
- ISO/TC 27/SC 5 Methods of analysis
- ISO/TC 30 Measurement of fluid flow in closed conduits
- ISO/TC 67 Oil and gas industries including lower carbon energy
- ISO/TC 67/SC 2 Pipeline transportation systems
- ISO/TC 67/SC 10 Enhanced oil recovery
- ISO/TC 207 Environmental management
- ISO/TC 207/SC 7 Greenhouse gas and climate change management and related activities
- ISO/TC 301 Energy management and energy savings
- CEN/TC 474 CO_2 capture, transportation, utilization, storage (CCUS) and carbon accounting

The business plan for ISO/TC 265 will be regularly updated as the development of International Standards progresses.

ISO/TC 265 recognizes that not all subject matter in CCS is ready for standardization. ISO/TC 265 further recognizes that CCS is a dynamic and evolving subject, so care will be taken to ensure that standards remain up-to-date and do not impede innovation. There are different kinds of standards for different situations and ISO/TC 265 will monitor the development of standards to ensure that requirements are appropriate for the intended circumstances.

6 Factors affecting completion and implementation of the ISO/TC work programme

The number of member bodies, liaisons and, consequently, experts in the various working groups, will likely challenge the time required to complete the work of ISO/TC 265 because:

- A common understanding of the priorities for the standards has to be realized by all members of the working groups. New work items may also challenge the member bodies in providing appropriate resources.
- New participants are anticipated who will have to develop an understanding of the work of the TC and the rapidly evolving field of CCS.

Other factors affecting the completion and implementation of the work include:

- The cost of attending and hosting meetings can limit the ability of many member bodies, delegates, and liaisons to participate in and host meetings. Thus, teleconferencing and web meetings are utilized to the maximum extent possible, even though this is generally less efficient than face-to-face meetings.
- Participants who have the necessary expertise are commonly busy in their normal work, and thus the time available to work on the development of standards may be limited.
- Participants may have difficulty in sustaining the necessary technical expertise and funding.

7 Structure, current projects and publications of the ISO/TC

Information on ISO online

The link below is to the TC's page on ISO's website:
ISO TC 265 on ISO Online

Click on the tabs and links on this page to find the following information:
- About (Secretariat, Committee Manager, Chair, Date of creation, Scope, etc.)
- Contact details
- Structure (Subcommittees and working groups)
- Liaisons
- Meetings
- Tools
- Work programme (published standards and standards under development)

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work

ANNEX

ISO/TC 265 resolved to use the term GHG (Greenhouse Gas) in all of its projects across all Working Groups in the following manner:

1. The composition of the CO_2 stream shall be quantified;
2. The emissions of CO_2 shall or should be quantified;
3. The term GHG (Greenhouse Gas) may be used in ISO/TC 265 Standards for the purposes of quantification of GHG emissions. Use of GHG shall be consistent with other GHG related standards (e.g. ISO 14064), but shall be non-normative (i.e. “may” or “can”) in ISO/TC 265 Standards.