Abstract

Carbon Capture and Storage (CCS) is a process that can mitigate the CO₂ emissions from power plants and other industrial sources of CO₂. Many of the individual processes (or phases) that are linked together to comprise a CCS chain have been proven for some time, albeit often in different contexts. Others are still being developed or adapted to this new application. Additionally, bringing them together in a CCS configuration represents a new application, with which there is limited global experience to date. As a result, there is an important need for knowledge development as real experience is gained in the comprehensive application of these technologies.

As with most technologies, CCS has inherent risks which need to be analyzed and managed. Integrated projects, given their especially long-term and multi-component aspects, impose particular
importance and challenge upon comprehensive risk identification. Risk assessment (detailed risk description and quantification) is completed using all available data, and assessment refreshed with updated numerical simulations which enable comprehensive risk analysis throughout the project lifecycle. The project lifecycle extends across all project phases from business development to site selection through post-closure. Together, risk identification, assessment, analysis, evaluation, management and treatment are integrated into a risk management plan. The risk management plan aids in decision-making by the owner/operator and, to the extent the results of planning are communicated, aids in evaluating the project by other stakeholders.

Keys to the success of the risk management plan are the integration and iterative application of the risk assessment, risk data, and risk analysis. Risk analysis and numerical simulation help to identify, estimate and mitigate risks that may arise from CCS projects. These tools are also useful to optimize the design and operation of the monitoring, verification, and accounting aspects of the projects and can serve to inform and facilitate more effective site characterization and model improvement. Risk tools can be used to shape the design and operation of preventive and remediation options at every stage in the project lifecycle. Effective risk management communication to stakeholders who may be affected is crucial to the success of the project. The risk management plan can serve as a key component of the information handled through the public outreach and communication plan.

Technical report (TR)27918 is designed to be an information resource for the potential future development of a standard for overall risk management for CCS projects by Technical Committee ISO/TC 265, Carbon dioxide capture, transportation, and geological storage. The scope of the report is intended to address more broadly applicable lifecycle risk management issues for integrated CCS projects. Specifically, the focus of the report is on risks that affect the overarching CCS project or risks that cut across capture, transportation, and storage affecting multiple stages. Overarching (OA), or overall risks are risks that affect the entire CCS project. Cross-cutting (XC) risks are risks that affect more than one part of a CCS project chain. Integration risks are considered cross-cutting for the purposes of the report.

The main contents of the report include:
(1) General information on lifecycle risk management for CCS. Defining lifecycle for an integrated CCS project based on the various lifecycle descriptions from the existing literature.
(2) An analysis of how a CCS standard could address aspects of risk analysis that apply to all elements of the CCS chain, such as:
   — Risk identification (identifying the source of risk, event, and target of impact)
   — Risk evaluation and rating
   — Risk treatment
   — Risk management strategy and reporting
(3) An inventory of the overarching and crosscutting risks, such as:
   — Environmental impact assessment
   — Risk communication and public engagement
   — Integration risks between capture, storage, and transportation operators, such as risk of non-conformance of CO₂ stream to required specifications
   — Integration risks associated with shared infrastructure (hubs of sources, common pipelines, hubs of storage sites)
   — Risks resulting from interruption or intermittency of CO₂ supply and/or CO₂ in-take
   — Risks associated with policy uncertainty
   — Incidental risks from activities related to the capture, transportation or storage processes without being specifically covered in the respective standards (e.g. management or disposal of water produced as a by-product of CO₂ storage)

The technical report contains information that may be valuable for writing a standard that provides guidance for processes that a CCS project operator shall, should, or may address. Such a standard would articulate and describe procedures to follow, which are designed to ensure that important overarching and crosscutting risks have been comprehensively sought, evaluated, and
addressed. The OA and XC risks listed in the report should not become a default list that is deemed to be comprehensive, but can serve as a starting set of examples.

Lifecycle risk assessment and management is practiced in CCS Projects and has been addressed by various regulations, best practices and standards. Within this area of practice, the OA/XC/Lifecycle topics described in the TR are addressed through a process requiring a project-specific risk assessment.