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Developments in Insurance Services to Facilitate CO_2 Geological Storage

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IEAGHG

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CONTACT DETAILS

Tel: +44 (0)1242 802911
E-mail: mail@ieaghg.org
Internet: www.ieaghg.org

Address: IEAGHG, Pure Offices,
Cheltenham Office Park, Hatherley Lane,
Cheltenham, GL51 6SH, UK

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Scope and Limitations

This report serves as an overview of recent developments regarding insurance offerings for carbon capture and storage (CCS) and in particular geological storage of CO_2. Many papers and articles in this sphere have been published, contributing to knowledge in this domain. This report is intended to serve as a high-level summary paper, where footnotes with references and links, and supplementary references at the end offer the interested reader a deeper level of detail.

Much of the information on project specific insurance policies remains business confidential between carriers and their clients, meaning detailed documentation is often not publicly available. However, industry perspectives, practical insights, and observed practices have been shared with the author through conferences, interviews, and professional discussions. Important and relevant learnings have been synthesised and, where appropriate, may be cited as "personal communications".

Because the pace of CCS activity has accelerated so quickly—with new conferences, reports, commercial announcements, and technical progress emerging almost weekly—achieving full completeness is difficult. The lists provided, therefore, should be viewed as illustrative rather than exhaustive, and open to ongoing updates and refinement.

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Executive Summary

- Recently the insurance sector has supported a surge of constructive activity around carbon capture and storage (CCS) projects. Brokers, carriers, reinsurers, the Lloyd's market, and government entities have each advanced important pieces of the insurance ecosystem, collectively helping to enable the scale-up of an integrated commercial CCS business, or "value chain". These roles are explored in the report.
- Private-sector insurance products covering most parts of the CCS value chain are available through a suite of existing oil-and-gas-derived policies, that can be utilized or modified to address project specific requirements. A single standardized policy covering the entire CCS value chain does not yet exist but remains an industry objective.
- Brokers and carriers are both actively developing new offerings in anticipation of future growth in CCS deployment, positioning themselves for anticipated growth in demand as more carbon storage projects transition toward commercial deployment and further private-sector financing.
- Policy terms and pricing are typically treated as business-confidential and are almost never disclosed in public forums or knowledge sharing settings. For storage projects, insurers emphasize that coverage conditions and premium levels are highly project-specific and are negotiated only after a detailed technical assessment of elements such as local geology, wells, monitoring strategy, regulatory framework, and long-term liability structure.
- Publicly available information and market-participant feedback indicate that demand for storage-specific insurance remains at an early stage. While commercial products and adapted conventional covers are available, the volume of publicly documented placements remains limited, and availability, capacity and terms continue to be highly project specific. Although long-term scale-up is still expected, the number of commercial projects seeking private-sector insurance does not yet appear sufficient to meet insurance industry revenue expectations[1]. Activity remains in an investment and market-building phase: brokers are earning fees for advisory and placement work, but carriers are not yet seeing premium volumes large enough to support a fully established class of business. Further project deployment is likely to improve the availability of operational data and

[1] Pers comms & M Golnaraghi et al., *Bringing Climate Tech to Market: The Powerful Role of Insurance* (The Geneva Association, April 9, 2024).

support continued development of insurance capacity. Looking ahead, carriers—through initiatives such as the Geneva Association (GA), Oil and Gas Climate Initiative (OGCI) and Clean Energy Ministerial Carbon Capture Utilisation and Storage Initiative (CEM CCUS) collaboration and their own internal programs—are actively working to understand the distinctive and emerging risks associated with CO_2 storage. Their aim is to improve understanding of the risks, identify appropriate risk-allocation and risk-transfer mechanisms, and develop insurance solutions suited to project and jurisdiction-specific circumstances.

- New insurance models are currently being developed and evaluated across carrier, broker, government and legal entities.

Introduction

The geological storage of carbon dioxide (CO_2) is an important component of global strategies to reduce greenhouse gas emissions, particularly in hard-to-abate industrial sectors. Beyond its role in emissions mitigation, CO_2 storage is part of a broader Carbon Capture, Utilisation and Storage (CCUS) framework that enables the production of low-carbon fuels, chemicals, and materials to meet growing global demand. Geological storage involves injecting CO_2 into deep subsurface formations—typically saline aquifers or depleted hydrocarbon reservoirs—where it is permanently retained through a combination of structural, residual, solubility, and mineral trapping mechanisms. The technical feasibility of this approach has been demonstrated through decades of industrial experience, including the Sleipner project in the Norwegian North Sea, which has operated since 1996, and the Quest project in Alberta, which has injected more than one million tons of CO_2 annually since 2015[2]. These projects, among many others, show that subsurface containment can be achieved reliably when supported by site characterization, monitoring, and well-designed operational controls within an informed regulatory framework.

A key enabler for safe CO_2 storage is a robust storage regulatory framework. Several regulatory regimes for geological storage are in practice. The European Union's CCS Directive (2009/31/EC) is comprehensive and requires operators to demonstrate complete containment before liability transfer and mandates a minimum 20-year post-closure period unless earlier transfer is justified. In July 2024, the European Commission issued revised guidance documents to clarify implementation of the CCS Directive and promote uniform permitting regimes across Member States. The United States regulates CO_2 injection under the EPA's Class VI well program, which sets requirements for site

[2] IEAGHG, "The Shell Quest Carbon Capture and Storage Project", 2019/04, September 2019 and, Equinor ASA, *Sleipner CO_2 Storage Project*, https://www.equinor.com/energy/sleipner.

characterization, well construction, monitoring, and post-injection site care and closure. The United Kingdom's North Sea Transition Authority (NSTA) oversees licensing, financial assurance, and storage permit conditions for offshore storage. Canadian provinces, including Alberta, have established post-closure stewardship funds to manage long-term liability.

Recently the insurance landscape for geological storage evolved significantly with improvement in products, market engagement, and understanding of project operations. Technical research improved understanding of containment risk, particularly through long-term modelling of CO_2 fate and pressure evolution[3]. Regulatory frameworks have also matured, clarifying requirements for financial assurance, monitoring, and post-closure liability transfer.[4] Insurers have introduced new products addressing leakage liability, business interruption, tax credit recapture, carbon credit reversal, and cross-chain performance risk. In Europe the emergence of multi-user CCS networks has introduced new interdependencies across the value chain. These networks require sophisticated contractual and insurance structures to manage risks such as commissioning misalignment, off-specification CO_2, and outages in transport or storage infrastructure.[5]

Despite these advances, challenges remain. Insurers continue to face limited historical loss data, uncertainties in quantifying leakage probabilities, and difficulties allocating long-term environmental liability[6]. Regulatory regimes differ across jurisdictions, complicating the development of standardized insurance products. Nevertheless, the trajectory of market development suggests that insurance services will increasingly function as an enabling mechanism for CCS deployment, providing financial security, supporting regulatory compliance, and enhancing investor confidence.[7]

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[3] A. P. Bump and S. D. Hovorka, "Pressure space: The key subsurface commodity for CCS," *International Journal of Greenhouse Gas Control*, vol. 136, 2024, Art. no. 104174.

S. E. Gasda et al., "A hierarchical approach for modeling regional pressure interference in multi-site CO_2 operations," *Geoenergy Science and Engineering*, May 2025.

[4] International Energy Agency, *Carbon Capture, Utilisation and Storage: The Opportunity in a Time of Transition* (2020).

[5] Liberty Specialty Markets, "Navigating the Energy Transition: Supporting the Risk Management Community," January 2025, https://www.libertyspecialtymarkets.com/article/navigating-the-energy-transition-supporting-the-risk-management-community. *&*
Marsh, "A new insurance solution for risks in interdependent carbon capture and storage value chains," 2026.

[6] IEAGHG, 'Insurance Coverage for CO_2 Storage Projects', 2024-TR04, August 2024, doi.org/10.62849/2024-TR04

[7] Global CCS Institute, *Global Status of CCS 2023* (Melbourne: GCCSI, 2023).

Aims and Purpose

This report expands upon the 2024 IEAGHG review of insurance coverage for CO_2 geological storage projects[8], responding to the rapid acceleration of CCS activity and the growing commercial importance of insurance in project development. The pace of CCS activity has accelerated quickly—with new conferences, reports, commercial announcements, and technical progress emerging almost weekly, including a series of CEM/GA/OGCI workshops which has focused specifically on insurance gaps and advances[9]. The aim of this edition is to provide a more comprehensive reference document that supports informed decision making across industry stakeholders—technical experts, insurers, developers, regulators, and financiers—while opening pathways to deeper research and helping developers prepare the data and messaging needed to secure insurance coverage and strengthen the commercial basis for geological carbon storage projects.

Methods and Approach

Since much information on project-specific insurance policies remains business-confidential, this report is built primarily on structured desk-top research, drawing from peerreviewed technical literature, institutional white papers, conference proceedings, relevant websites, commercial announcements, and press releases. The report also incorporates practical insights and information shared through conferences, interviews, and professional discussions, with such contributions cited as "personal communications". This approach reflects both publicly available evidence and personal experience of practitioners actively shaping insurance frameworks for CCS projects.

Factors shaping insurance for geologic CO_2 storage

The risks linked to CCS projects generally fall into five broad groups:

(1) *Financial risks* cover counterparty credit exposure and the possibility of losing carbon credits the project expects to earn.

(2) *Safety and operational risks* relate to worker injury and disruptions to operations, including any loss-of-containment events.

(3) *Technology risks* arise when key systems—such as monitoring, capture, or sequestration technologies—fail to function as designed.

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[8] IEAGHG, 'Insurance Coverage for CO_2 Storage Projects', 2024-TR04, August 2024, doi.org/10.62849/2024-TR04

[9] Geneva Association/Oil and Gas Climate Initiative/Clean Energy Ministerial – Carbon Capture and Storage conferences 2024-2026.

(4) *Regulatory risks* stem from changes in permits, compliance obligations, environmental liability, or shifts in policy frameworks that support or incentivize CCS.

(5) *Integration risks* reflect challenges in aligning CCS processes with existing infrastructure and operations, as well as dependencies across the value chain, such as customers failing to supply contracted CO_2 volumes[10].

Storage Risks

Although the broader CCS value chain includes construction, capture, compression, and pipeline risks, this report concentrates specifically on geologic storage, with focus on environmental liabilities, regulatory financial assurance requirements, and carbon credit-linked risks.

Leakage

Leakage in the CCS value-chain has different meanings depending on stakeholder perspective. Technical and geological stakeholders define leakage as loss of containment or CO_2 moving outside the intended storage interval. Insurance markets treat leakage as an event that triggers liability, environmental impairment, or business interruption, focusing on the operational boundary of the facility, well, or reservoir. Regulatory authorities frame leakage as injected CO_2 crossing a legal or permitted boundary—such as the injection zone, storage complex, a protected aquifer, or other regulated resource. The IPCC GHG Inventory definition which is used in carbon accounting and emission trading schemes (EU, UNFCCC, etc.) states that "leakage is defined as a transfer of CO_2 from beneath the ground surface or seabed to the atmosphere or ocean.[11]

Over the past thirty years, research into the likelihood and potential effects of CO_2 leakage has established a technical foundation for understanding the behaviour of stored CO_2 in the subsurface. Published research generally indicates that geological leakage from well-characterized and managed sites is unlikely[12]. Nonetheless, during an evaluation of a specific project for potential CCS leakage issues insurers recognize that

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[10] Geneva Association/ Oil and Gas Climate Initiative / Clean energy Ministerial 'Enhancing the Insurability of Carbon Management Projects: Guiding Tenets' October 2026

[11] IPCC 2006 Guidelines for GHG Inventories, Vol 2 Energy, Chapter 5, section 5.6.1.

[12] 'IEAGHG, "Reviewing the implications of unlikely but potential CO_2 migration to the surface or shallow subsurface", 2025-01, January 2025, doi.org/10.62849/2025-01

leakage could create potentially material consequences[13]. The scientific consensus and data from existing CO_2 injection operations is appreciated in the insurance market, but without extensive loss-history for permitted CCS projects, leakage probabilities and potential impacts remain areas of uncertainty and continued focus for underwriters assessing commercial exposure.

Potential leakage pathways include wells, faults and fractures, caprock integrity failures, and lateral migration beyond the storage complex. Recent studies have suggested that while leakage is unlikely, impacts would be generally localized and manageable, and operational and monitoring technologies can detect leakage early. [14]

Minor operational leakage—typically arising from wellhead components, monitoring wells, or surface-level infrastructure—can trigger regulatory intervention requiring temporary suspension of injection operations. Even small releases may necessitate investigation, remediation, and enhanced monitoring, creating both direct remediation costs and indirect business-interruption losses for the storage operator [15].

Monitoring

Monitoring, reporting, and verification (MRV) systems are essential for regulatory compliance and insurance underwriting. Monitoring is central to how insurers evaluate and structure coverage for geologic storage projects because it provides the verifiable evidence needed to assess containment performance and detect any deviations from expected reservoir behaviour[16]. High-quality, regulator-approved MRV systems reduce uncertainty around plume migration, pressure evolution, and potential leakage pathways. This supports insurer assessment of project-specific risks, allowing insurers to price risk more accurately and offer broader or more affordable coverage. Conversely, weak or inconsistent monitoring increases uncertainty and can limit available insurance products, narrow coverage terms, or raise premiums, since insurers rely on continuous operational

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[13] Insurance terms include:

Maximum Possible Loss (MPL) The absolute worst-case outcome assuming everything goes wrong and no mitigation succeeds.

Maximum Foreseeable Loss (MFL) constrained to what is *plausibly* foreseeable.

Probable Maximum Loss (PML) The worst loss that is *probable* under adverse but realistic conditions

[14] 'IEAGHG, "Reviewing the implications of unlikely but potential CO_2 migration to the surface or shallow subsurface", 2025-01, January 2025, doi.org/10.62849/2025-01

[15] European Commission, *Commission Decision 2011/92/EU on Guidelines for Monitoring and Reporting under Directive 2003/87/EC*, Annex I (monitoring requirements for CO_2 storage sites).

[16] It is important to make the distinction between the post-injection site care period (PISC) and site closure. In the US, the PISC period is the default monitoring period following cessation of injection and the closure period is when an operator can make a demonstration that the project does not pose a risk to drinking water sources (USDW). Once approved, the operator plugs all wells. Upon completion, the operator is released of financial responsibility obligations under EPA UIC Class VI program.

data to confirm that the storage complex is behaving as modelled and that any leakage would be detected early enough to mitigate losses. Technologies include time-lapse seismic imaging, pressure and temperature monitoring, soil gas and groundwater sampling, satellite-based atmospheric monitoring, and geochemical tracers. [17]

Project Closure

Project risk declines when injection of CO_2 is completed[18] (Figure 1).

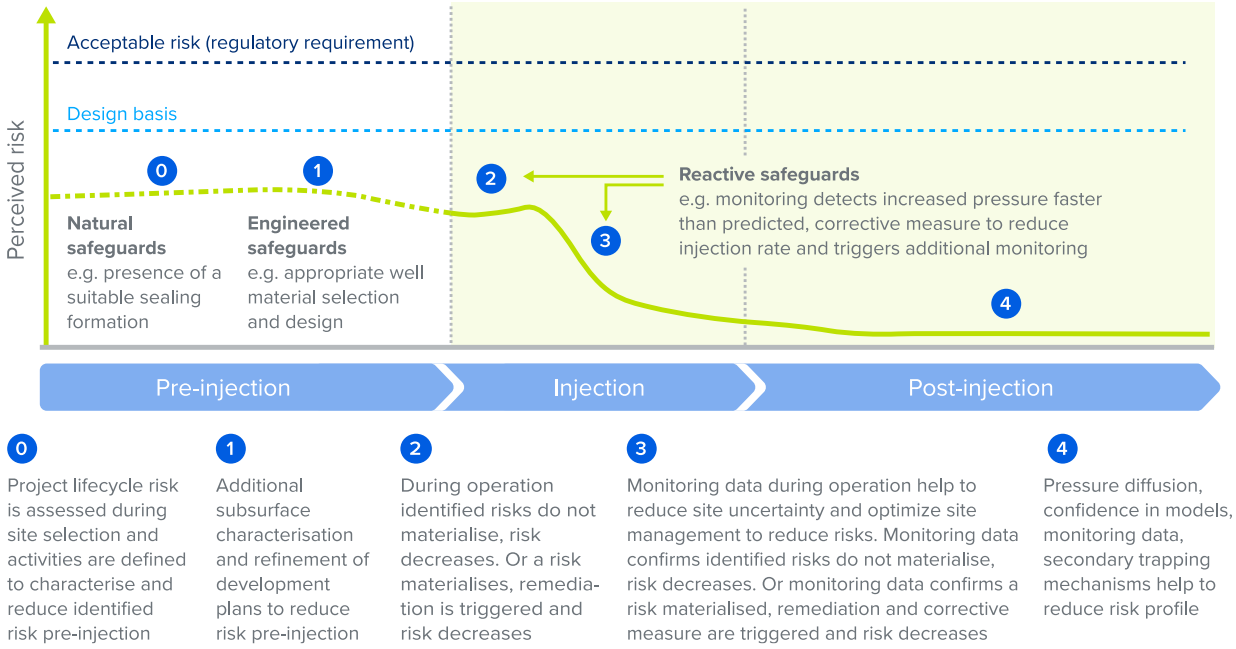

Figure 1: Lifecycle risk profile for an idealised CO_2 storage project showcasing risk management through implementation of safeguards, monitoring and corrective measures. The green line represents the risk profile. Pre-injection is dashed as the risks have been characterised and assessed but are not active until injection commences.[19]

Within the CCS value chain, post-injection management of storage projects is a unique/novel concern for insurers and regulators with some jurisdictions requiring post-injection monitoring by the operator for decades. The IEAGHG's 2026 report on

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[17] IEAGHG, "IEAGHG Monitoring Selection Tool Updates 2024-2025", 2025-TR02, August 2025, doi.org/10.62849/2025-TR02. https://ieaghg.org/monitoring-selection-tool/
Hovorka, S.D., Couëslan, M.L. and Jenkins, C., 2026. Evolution of storage monitoring–update in response to commercial and regulatory drivers. *International Journal of Greenhouse Gas Control*, *154*, p.104693.
IOGP report https://www.iogp.org/bookstore/product/recommended-practices-for-measurement-monitoring-and-verification-plans-associated-with-geologic-storage-of-carbon-dioxide/

[18] The May 2026 report "Geological storage post-injection risk and liability" was published by DNV in collaboration with the Oil and Gas Climate Initiative (OGCI). It outlines how proper site selection, disciplined injection management, and risk-based monitoring affect potential subsurface liabilities before project closure.

[19] This figure from the OGCI/DNV report: Geological storage post-injection risk and liability May 2026 is used with permission.

conformance and containment risk emphasizes that technical risk generally declines after injection ceases, as pressure dissipates, plume behaviour stabilizes, and trapping mechanisms strengthen [20]. The OGCI's 2026 report on post-injection liability similarly notes that long-term liability frameworks must balance public protection with project bankability, ensuring that operators are not burdened with disproportionate long-term obligations that could deter investment[21]. These papers are recently published resources illuminating project case histories, current technical knowledge, and general perceptions around leakage issues and related long-term liability.

Current Insurance Solutions

The development of insurance solutions for CCS has accelerated in recent years, reflecting both improved technical understanding and growing commercial demand. Insurance products addressing elements of the CCS value chain are increasingly available, ranging from capture and transport through to storage-related risks. Although the availability and maturity of these products vary across jurisdictions, the overall trend indicates increasing insurer willingness to underwrite CCS-related risks, provided that projects demonstrate detailed site characterization, transparent monitoring, and credible operational controls. Between 2023 and 2026, insurers introduced or promoted products addressing leakage liability, business interruption, tax credit recapture, carbon credit reversal, and cross-chain performance risk. Leakage liability insurance covers remediation costs, environmental damage, regulatory penalties, and carbon credit reversal. Business interruption insurance addresses forced CO_2 venting, off-spec CO_2 disruptions, and transport or storage outages. For transport and storage operators, revenue-related risks associated with delays, lower-than-expected CO_2 volumes or network interruptions may also be important considerations. In many jurisdictions these risks continue to be addressed through a combination of contractual arrangements, public-support mechanisms and evolving commercial insurance solutions. Tax credit insurance, particularly relevant in the United States for 45Q credits, covers recapture, disqualification events, and associated penalties. Carbon credit replacement insurance provides in-kind replacement of lost credits. Cross-chain liability insurance addresses risks in multi-user networks, including commissioning misalignment and counterparty non-performance[22].

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[20] IEAGHG, *Evolution of Conformance and Containment Risk Over Time in CO_2 Storage Projects – The Link to Post-Closure Stewardship and Handover*, Technical Report 2026-04, March 2026, doi:10.62849/2026-04.

[21] OGCI & DNV, "Geological storage post-injection risk and liability," May 2026.

[22] Howden & Energex Partners (2026). *Closing the Risk Gap: How Insurance Innovation Can Accelerate CCS Deployment*.

Geologic CO_2 storage operations present the most distinctive and unique risks[23]. These include well integrity failures, induced seismicity, caprock breach, and long-term containment. Insurance products for storage operations have historically been limited, but recent developments have expanded the range of available coverage. Environmental impairment liability (EIL) insurance provides coverage for contamination events, although policy periods are typically shorter than the multi-decadal timescales associated with geological storage.[24]

Tax credit insurance has emerged as a significant product in the United States, where the federal 45Q tax credit provides incentives for the capture and storage of CO_2. Tax credit insurance covers recapture risk, disqualification events, and associated penalties and interest[25].

Carbon credit replacement insurance represents another recent innovation with firms offering in-kind replacement of lost carbon credits, addressing the risk of reversal in carbon markets. This product is particularly relevant for projects generating carbon dioxide removal (CDR) credits, where permanence of storage in line with applicable standards and regulations required in order to keep earned credits.[24].

Carbon capture and storage projects share much of their risk profile with upstream oil and gas operations, meaning that the majority of the CCS value chain can be insured using well-established energy market products. Construction risks, operational property damage, business interruption, marine exposures, liability, and well-control protections can map onto capture plants, CO_2 pipelines, compression stations, and injection wells (Table 1).

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[23]IPCC, *Special Report on Carbon Dioxide Capture and Storage*, Chapter 5: Underground Geological Storage, 2005.

[24] U.S. EPA, *Financial Responsibility Guidance for Class VI Wells*, Office of Underground Injection Control, 2013. Willis Towers Watson (2026). *The CCS Chain Reaction: Managing Key Risks Can Unlock Decarbonization at Scale*.

[25] Impact Capital Partners, "ITC Insurance 101: Understanding How Insurance Protects Buyers and Sellers in the Tax Credit Market," October 2025.

Table 1: Insurance Products that may apply to or may be modified to fit CCS project specific requirements

Insurance Product	Description
Construction / Erection All Risks	Insurance that protects a project while it is being built, covering accidental damage to equipment, structures, or materials before the facility becomes operational.
Delay in Start Up	Coverage that pays for financial losses if a project cannot begin operating on time because of damage during construction.
Capture Infrastructure Insurance	Coverage for building and operating CO_2 capture plants, including damage, downtime, liability, and problems caused by CO_2 that does not meet purity requirements.
Operational Property Damage	Insurance that pays for repairs or replacement when an operating facility is damaged by accidents such as fires, storms, or equipment failures.
Business Interruption	Coverage that compensates a company for lost income when operations are halted because something has gone wrong with the facility.
Third-Party Liability	Coverage that pays for injuries, property damage, or environmental harm caused to other people or companies.
Marine Hull, Cargo, and Transit	Protection for ships, vessels, and equipment transported over water or land, covering damage during movement.
Workers' Compensation / Employers' Liability	Insurance that covers injuries or illnesses suffered by employees while doing their jobs.
Decommissioning Liability / Abandonment Guarantees	Financial protection that ensures funds are available to safely close and dismantle wells and facilities at the end of their life.
CO_2 Transport Insurance	Protection for pipelines, compression stations, ships, and other systems that move CO_2 from capture sites to storage sites.
Control of Well / Operator's Extra Expense	Insurance that pays for the costs of stopping a well blowout, regaining control, cleaning up pollution, and drilling a replacement well if needed.
Storage and Injection Insurance	Coverage for injection wells and storage reservoirs, including costs of responding to leaks, managing plume movement, and dealing with shutdowns.
Pollution Liability / Environmental Impairment Liability	Insurance that covers cleanup costs and damages when pollution escapes into the environment, whether suddenly or gradually.
Parametric insurance	Provides rapid liquidity for non-damage triggers
Carbon Credit and Compliance Insurance	Insurance that pays when a project cannot deliver promised emissions reductions or fails to meet tax-credit or regulatory requirements.

What remains more challenging is the portion of risk tied to geological storage, where long-term liability, various degrees of leakage, plume migration, and post-closure obligations introduce exposures that differ from traditional oil and gas models.

Insurance ecosystem

The insurance business ecosystem includes specific stakeholders/subdisciplines with interrelated roles. The main roles include brokers, carriers, captive insurance companies, Lloyds insurance marketplace, and reinsurance firms. A captive insurance company is a wholly owned subsidiary established to insure the risks of its non-insurance parent company or affiliates. Captive insurance entities utilized by oil and gas majors include Ancon Insurance Company, Solen Versicherungen, Pan Insurance DAC, Jupiter Insurance, and Everen[26].

Lloyd's of London is a regulated insurance marketplace or exchange where independent underwriting syndicates (the carriers) write specialized policies for risks brought to them by brokers. Lloyds is active in providing insurance policies for CCS, but does not provide information to the public about policy placements.

Reinsurance is insurance for insurance companies. Reinsurers deal with primary insurers, not insurance customers. They cover bundles of insurance policies rather than individual projects.

Insurance brokers meet with customers, assess needs, research policy options, make insurance recommendations, and advise clients on strategy. Insurance brokers are usually the first line of contact for storage project developers that need insurance to meet project needs. Brokers work with the developer to understand and assess the project risks, design an insurance strategy that meets regulatory requirements, and prepare data needed by underwriters to evaluate risks, prepare policies and quote premiums. Brokers shop the project to qualified carriers and help the developer choose the best coverage. Brokers are generally compensated through commissions paid by the insurance carriers that place project policies, and sometimes by fees charged to the developer for specialty services such as risk engineering, modelling, and regulator support.

While many brokers work with clients involved with CCS and specifically storage projects, several prominent brokers have announced insurance products specifically linked to CO_2

[26] Captives are licensed insurers owned by large energy groups to underwrite their own operational risks. For an overview of captive structures and operations, see NAIC, "Captive Insurance Companies" (2026) or Investopedia, "Captive Insurance Companies: Risk Management and Benefits Explained" (2026).

storage or have been vocal on the topic in public. Examples include Howden, Marsh, Lockton and WTW[27].

Howden announced an insurance facility specifically for carbon storage (and related transport issues) in January of 2024[28]. Marsh offers insurance designed to address risks that arise across interdependent CCS value chains and a non-damage solution for unexpected CO_2 leakage from geological storage sites. Marsh's approach adds a non-damage trigger for geological leakage. Aon launched the first fully comprehensive carbon capture and storage insurance solution to support energy transition. Lockton reports their approach to CCS insurance is project specific with unique risks and needs. Lockton supported the Trailblazer and Tallgrass projects in the US. Most recently in May 2026, WTW (Willis) announced the availability of an integrated insurance suite designed specifically for developers and operators of CO_2 capture, transportation and storage infrastructure, adapting property, upstream energy, marine, liability and environmental protections to the unique risks of storage operations (see Table 2 for references and links).

Insurance carriers are the companies that write policies, set premiums, and pay claims. These companies put their capital at risk to back the policies they bind. They determine whether a risk is insurable, define and set terms and exclusions, and pay claims. Brokers design, market, and administer insurance products for CCS, but carriers insure the risk.[29].

When carriers assess a specific storage project, underwriters evaluate as much project data as possible including containment characteristics of the reservoir, injection well integrity, plume behaviour and reservoir modelling, and the robustness of monitoring, measurement, and verification plans. Their underwriting incorporates the regulatory framework governing the project—such as U.S. Class VI requirements or the EU CCS Directive—and the contractual allocation of liability among emitters, transport operators, and storage site owners. These assessments determine whether coverage is offered, the limits available, and the conditions or exclusions attached to the policy[30].

Carriers also play a central role in enabling project bankability. Often, geological CO_2 storage projects must satisfy financial assurance requirements, such as those under EPA

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[27] This short list is not exhaustive; entities were identified through desk-top research and meant to illuminate a few recent offerings as examples.

[28] SCOR (2024, January), SCOR *Syndicate Leads Carbon Capture and Storage Insurance Facility* https://www.scor.com/en/news/scor-syndicate-leads-carbon-capture-and-storage-insurance-facility)

[29] Marsh, "A new insurance solution for risks in interdependent carbon capture and storage value chains," 2026.

[30] Another critical function is the provision of insurance capacity—the amount of risk a carrier is willing to take on. For CCS projects, capacity often comes from multiple sources, including Lloyd's syndicates, global environmental liability carriers, energy insurers, and specialty MGAs backed by carrier paper. Large storage sites may require a layered tower of several carriers to achieve sufficient limits, reflecting the scale and duration of potential liabilities.

Class VI, meet lender expectations for long-term liability coverage, address investor concerns about permanence and regulatory exposure, and comply with and comply with the applicable voluntary and compliance markets standards and regulations. Appropriate insurance and other financial-risk management arrangements can support project bankability and may be required by lenders, regulators or contractual counterparties. The appropriate solution will depend on the project structure, jurisdiction, sponsor capacity and allocation of risk.

A growing number of prominent insurance carriers are now publicly active in carbon capture and storage, including SCOR, Liberty, Beazley, Munich Re, Swiss Re, Allianz Commercial, Arch, and AXA XL, each of which has released statements or product notes signalling underwriting appetite for CO_2 transport and geological storage risks. SCOR, through its Lloyd's syndicate, leads the leakage insurance facility launched by Howden in 2024, offering coverage for sudden or gradual CO_2 release from storage sites, associated environmental damage, revenue loss, and liabilities linked to carbon credits and emissions allowances. Allianz Commercial has confirmed underwriting several major CCS and carbon dioxide removal projects, including Stratos in Texas and Norway's Sleipner and Snøhvit. Liberty Mutual supports CCS through its Environmental, Energy, and Transition Risk teams, providing policies across the energy and industrial sectors. AXA XL insures CCS as part of its broader energy-transition portfolio, underwriting project components through existing property, construction, energy, casualty, and specialty lines rather than a bespoke CCS-only product. Beazley offers coverage for CCS projects—particularly onshore—and reports insuring a U.S. ethanol facility. Arch positions itself as a technically focused, geology-driven CCS underwriter, while OAK Global's 2026 Lloyd's-based platform, OAK Horizon, includes CCS-related risks within its climate and technology offerings. Swiss Re provides specialized re/insurance and risk-transfer solutions to de-risk CCS projects and voluntary carbon-market contracts, addressing both physical non-delivery and long-term liability exposures. Great American also offers bespoke CCS policies, contributing to a rapidly expanding carrier landscape supporting commercial CO_2 storage deployment (see Table 2).

Listed below in Table 2 are companies that have announced insurance products linked to CO_2 storage or have been visible on the topic in public media. These entities were identified through desk-top research[31] . A link to company-relevant statements/offerings is presented in the table. The documents published on-line include white papers,

[31] As the recent pace of CCS insurance activity has accelerated new conferences, reports, commercial announcements, and technical notes emerge almost weekly and reporting a comprehensive list is challenging. The list provided, therefore, should be viewed as illustrative rather than exhaustive, and open to ongoing updates and refinement. Also, the existence of a published product or announcement should not necessarily be interpreted as evidence of broad market uptake, commercial competitiveness, or successful project deployment.

marketing releases, detailed reviews, projections of carbon storage market activity, listing of insurance offerings, and relevant industry news articles. The links represent a starting point for further investigation of the current engagement of each company with the carbon storage market.

The examples below were identified through desk research using publicly available information. The list is illustrative rather than exhaustive. Inclusion does not imply endorsement by IEAGHG, OGCI or their respective member organisations, nor confirmation that a product, capacity or particular policy terms are currently available for any specific project. Availability, scope, limits, exclusions and pricing remain subject to underwriting and project-specific circumstances.

Table 2: Illustrative public examples of CCS and carbon-market insurance offerings with links to relevant statements (click to link).

Organisation	Reference	Year
Brokers		
Howden	Scaling CCS: new risk management insights	2026
Marsh	CCS at Scale: Aligning risk and reality in CCS	2026
WTW	Integrated Risk and Insurance Solution for Carbon Capture and Storage	2026
Aon	Comprehensive carbon capture and storage insurance solution	2024
Lockton	Mitigating the risks of carbon capture and storage projects	2024
Carriers		
SCOR	Continuing to Support the Energy Transition through Carbon Capture and Sequestration/Storage	2026
Liberty Speciality Markets	Co-leading the insurance program for Stratos (construction phase) and involved with Northern Lights	2025
Allianz Commercial	Co-leading the insurance program for Stratos (construction phase) and involved with Northern Lights	2023
Beazley	Carbon capture and storage is an existing technology which we currently insure	2026
AXA XL	Active in CCS with conference and media presentations.	2025
Arch	Technically driven CCS underwriting combining geological, engineering and risk-management expertise.	2026
Oak Global	Active in CCS, offer parametric climate suctions and tax credit insurance	2026
Great American	Carbon sequestration Tax Credit Protection	2026
Lloyd's of London Syndicates	Risk revealed by Lloyd's: clean technologies and hard to abate sectors (CCUS), SCOR launch CCS insurance facility at Lloyd's	2024

Discussion

The future development of insurance services for geological CO_2 storage will depend on several factors, including improved technical understanding, regulatory clarity and harmonization, and the development of actuarial models tailored to geological CO_2 storage. These factors will shape the ability of insurers to quantify long-term risks, price coverage accurately, and provide products that support project bankability.

Improved technical understanding and reported operational experience, especially of geologic CO_2 storage, will likely be essential for reducing uncertainty and enhancing insurer confidence. Continued research on conformance and containment risk, plume behaviour, and long-term trapping mechanisms can help refine risk models and support the development of more accurate pricing. Operational data from existing CCS projects can also play a critical role in reducing uncertainty and improving model calibration. No large-scale CO_2 storage project has yet reached operational closure; therefore, insurance aspects of post-closure and long-term stewardship are yet to be fully understood. As projects will reach closure and post-closure phases, insurers will gain valuable insights into long-term containment behaviour and the effectiveness of monitoring systems.

Regulatory stability and clarity, and ultimately harmonization, will be important for enabling the development of standardized insurance products. Differences in regulatory frameworks across jurisdictions currently requires the tailoring of insurance products to particular national or regional circumstances. Harmonization of financial assurance requirements, monitoring standards, and liability frameworks could facilitate the development of standardized insurance products and reduce transaction costs. International collaboration, such as through the Clean Energy Ministerial's CCUS Initiative, may help promote convergence in regulatory approaches.

The development of actuarial models tailored to geological storage will be essential for enabling insurers to quantify long-term risks. Traditional actuarial models are not well suited to the multi-decadal timescales and subsurface uncertainties associated with geological storage. The development of new models that incorporate geological, geomechanical, and geochemical data will be important for enabling insurers to price long-term liability coverage accurately. These models should account for the evolution of risk over time, including the decline in risk after injection ceases and the strengthening of trapping mechanisms.

Public–private partnerships will continue to play a critical role in managing risks that are difficult to insure commercially. Governments may need to provide liability backstops, financial assurance mechanisms, or other forms of support to enable the development of large-scale CCS projects. These mechanisms can help address long-term liability and early-stage development risk, enabling insurers to focus on risks that are more amenable to commercial coverage. As the CCS industry matures, the role of public–private

partnerships may evolve, with governments focusing on long-term stewardship and systemic risk while insurers cover operational and short-to-medium-term risks.

While parts of the CCS chain are already insurable, gaps remain such as uneven maturity across value-chain segments, the lack of standard liability-allocation methods in multi-party arrangements, and the mismatch between long-term post-closure obligations and annual insurance policy structures.

Because project-specific insurance arrangements are typically treated as commercially confidential between carriers and project developers, detailed case studies of CCS insurance placements are rarely available in the public domain. Nonetheless, several high-quality sources provide insight into projects under development or operation across multiple jurisdictions. These include the *Global CCS Institute's annual assessments* of storage resources and market activity[32], the *U.S. EPA Class VI permit tracker* for emerging U.S. storage sites[33], and forthcoming analyses such as the *IEAGHG multi-user CCS networks report*[34]. Additional perspectives can be drawn from brokers and carriers who actively publish CCS market intelligence—firms such as Howden, Marsh, WTW, Liberty, SCOR, and Allianz—many of which contribute to collaborative research efforts on insurability and risk management for geological storage.

Next Steps

Although commercial insurance products for CCS projects are already available, the underlying research, modelling practices, and knowledge sharing that support effective coverage continue to evolve. In 2024, the Geneva Association (GA), the Clean Energy Ministerial CCUS Initiative (CEM CCUS), and the Oil and Gas Climate Initiative (OGCI) formed a strategic partnership to examine the most pressing challenges in insuring CCS deployment [35]. Between 2024–2026, this collaboration developed a structured workflow assessing insurance needs and constraints across the CCS project lifecycle—including multi-emitter systems, shared transport networks, geological storage operations, cross-border arrangements, risk-allocation frameworks, and long-term stewardship obligations. The insights emerging from this work are expected to shape both near-term

[32] Global CCS Institute, *Global Status of CCS 2023* (Melbourne: GCCSI, 2023).

[33] U.S. EPA, *Class VI Wells – Permit Applications and Approvals*, Underground Injection Control Program.

[34] IEAGHG, *Contractual Principles for Multi-User CCS Networks*, Technical Report (in press, 2026).

[35] *Expediting Commercial Deployment of Climate Technologies for Industrial Decarbonization* (The Geneva Association, 2024).

and next-generation CCS insurance products, enabling more efficient, effective, and lower-cost coverage as commercial storage scales over the coming decade[36].

Conclusions

In conclusion, the continued development of insurance services for geological CO_2 storage is expected to support the commercial deployment of CCS. While significant progress has been made in recent years, further work is needed to deepen technical understanding, solidify (and ultimately harmonize) regulatory frameworks, and develop actuarial models tailored to geological storage. Public–private partnerships are likely to continue to play a critical role in managing risks that are difficult to insure commercially. With continued innovation and collaboration, insurance services will support the development of scalable, bankable geological storage projects.

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11. Report 2 (With DOE and Breakthrough Energy on how): CCS case study https://www.genevaassociation.org/sites/default/files/2024-04/climate_tech_2_report_090424_web_.pdf

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CO_2 Storage Resource Catalogue

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The CO_2 Storage Resource Catalogue is an independent evaluation of geologic CO_2 storage assessments worldwide. It is a pioneering initiative to accelerate the deployment of carbon capture, use and storage (CCUS) by supporting the development of storage resources. The Global Storage Resource Database aims to support the CCUS industry by providing investor-level confidence in published CO_2 storage resources and understanding their commercial maturity and development.

The Catalogue has adopted the approach of the Society of Petroleum Engineers (SPE) Storage Resource Management System (SRMS) for the classification of global storage resources. Under this system, the evaluated geologic formations are defined as 'stored', 'capacity' and 'resource'. The intent is to capture the maturity of commercial resources available to CCUS projects globally.

The 13 countries evaluated in the CO_2 Storage Resource Catalogue so far represent the first assessment of a six-year public resource provided by the Oil and Gas Climate Initiative. The goal of the CO_2 Storage Resource Catalogue is to be the global repository for all future storage resource assessments.

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IEAGHG

ieaghg.org
+44 (0)1242 802911
mail@ieaghg.org

IEAGHG, Pure Offices, Cheltenham Office Park,
Hatherley Lane, Cheltenham, GL51 6SH, UK

IEAGHG