Global Cement and Concrete Association

GCCA Policy
CCUS

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Position Statement

Carbon Capture Utilisation and Storage (CCUS) is a critical lever in the GCCA 2050 cement and concrete industry roadmap to net zero concrete. This is the case even with all other CO_2 emission reduction technologies and new cement solutions being utilised.

The cement industry is committed to developing capture technologies. It is investing in research, developing pilot plants, and is embarking on industrial scale facilities. An industry roadmap milestone is for carbon capture technology to be applied at industrial scale in ten plants by 2030.

Governments have a fundamental role, with action needed now, to facilitate development of carbon capture in the cement sector in this decade and scaling it up from 2030. Supportive policy frameworks are required in the areas of financing, carbon accounting, carbon pricing and demand for low carbon products. Governments need to help industry build the business case for carbon capture installations and for transport and storage infrastructure, through appropriate regulatory and financial mechanisms (private financing and public financing mechanisms). Finally, there is a need for governments to provide financing and supportive frameworks to enable deployment and fair market access to transport and storage, appropriate risk allocation and to address issues of public acceptance.

Introduction

In 2021, GCCA published an ambitious Roadmap for net zero concrete by 2050. It outlines multiple levers and milestones that need to be taken on the path to net zero emissions.

The process emissions of cement production mean that, whilst GCCA members will make use of all technological solutions to reduce them, carbon dioxide will need to be captured, re-used if possible, or stored. Carbon Capture Utilisation and Storage (CCUS) technology is therefore an essential component of the Roadmap for net-zero concrete. A full-scale deployment of CCUS could fully eliminate the process emissions and potentially even result in carbon negative concrete with broad benefits for industry and society. (see box out. *To be written: box out on process and combustion emissions and biomass to show net negative potential.*)

CCUS pilot projects and industrial-scale carbon capture operations, are evidence that there is substantial momentum in development of the technology and further new projects are being announced in North America and Europe. While the industry is developing technologies, conducting pilots and investing in industrial-scale facilities, there is advantage being taken from mature technologies and commercial projects (such as Boundary Dam and Petra Nova) that have been deployed in other sectors (such as power, refining,). However, in order to realise the full emission reduction potential of CCUS, it is critical to create the right framework conditions and infrastructure within this decade to ensure its full deployment beyond 2030.

While the industry is already engaged in numerous CCUS projects, the sector cannot achieve this on its own. Deploying CCUS and related infrastructure requires a broad stakeholder dialogue and public acceptance as well as long-term commitments by governments and society alike. Some countries/regions like Canada, EU, UK and USA have announced different policy initiatives for enabling deployment. A set of targeted policy actions at local, national and international levels is needed to:

- Ensure investments for CCUS project construction and operation;
- Allow for the accounting of captured and stored or utilised CO_2 emissions;
- Create the infrastructure needed for CO_2 transportation and storage;
- Ensure concurrency in development of infrastructure and investment in capture;
- Ensure access to sufficient affordable decarbonised energy.

About CCUS

CCUS describes processes that capture CO_2 emissions from industrial sources and either stores them so that they will not enter the atmosphere or reuses them in other industrial processes or. CCUS is a crucial solution for the cement sector where a large share of emissions are not energy related but due to the specific chemistry of cement making.

Carbon capture

Carbon Capture technology is improving and the significant number of industrial scale facilities currently being deployed in cement production, demonstrates the technical viability. A variety of different capture technologies are currently being implemented at a range of scales. These include post combustion (e.g., chemical absorption by amines), direct separation, oxyfuel, calcium looping and adsorption by metal organic frameworks. Typically significant additional low carbon energy is needed for these technologies to operate the CO_2 separation and handling processes.

Utilisation (or Valorisation)

The aggregates and concrete industry is developing an economy for CO_2 by using CO_2 to manufacture useful products. CO_2 can be permanently bound in minerals to produce mineral products, such as aggregates and hardened concrete. In addition, concrete in use and at end of life can permanently store CO_2 through the process of carbonation. This has been long understood by engineers with respect to reinforced concrete and is rightly limited during operation for the sake of durability. Recent developments have focused on maximising CO_2 uptake in crushed concrete as a method of sequestering CO_2 [1].

Captured CO_2 can also be used in the production of e-fuels and as a feedstock for the chemical industry. More specific uses are to promote crop growth in greenhouses and in the food and drinks industries.

Storage

CO_2 can be stored or sequestrated in geological formations which would avoid it being released into the atmosphere. Examples of storage deployed at commercial scale are available from the Global Carbon Capture and Storage Institute CO2RE database and include Sleipner, Norway that has been storing millions of tonnes of CO_2 from an industrial process since 1996.

[1] Intergovernmental Panel on Climate Change (IPCC). (2023). AR6 Synthesis Report. https://www.ipcc.ch/report/ar6/syr/

Policy context

CCUS requires clear policies that will speed-up its development and affirm its long-term future.

Financing

The 2020's will be crucial to bring down costs across the entire value chain and allow for the development of a business case. Until this, an appropriate carbon price, as well as long-term predictability, is needed to enable companies to make further investments into CCUS projects.

Given the significant development and scaling costs of this technology, however, additional and targeted public funding is necessary to lower the financial risks associated with innovative, pioneer projects. This must include R&D, as well as the development, industrial deployment and early operational periods.

In order to attract further private investments, CCUS must also be incorporated and classified as a green economic activity in dedicated sustainable financing schemes, such as the EU Taxonomy.

CO_2 transport and storage

The widespread deployment of CCUS technologies will necessitate that cement plants manage large volumes of CO_2. Not every plant will have the capability to store CO_2 locally due to various geographical, geological, or logistical constraints. Consequently, some plants will need to transport CO_2 off-site to locations where it can be securely stored or utilized in other industrial processes. Transboundary cooperation will be important in some locations, with transboundary agreements to allow for movement of CO_2 and risk allocation.

The challenge of developing the necessary transport and storage infrastructure is significant and cannot be undertaken by the cement industry alone. Building this infrastructure and identifying suitable storage sites will require close collaboration with a wide range of partners, including regulatory agencies, industrial stakeholders, and other key players in the energy and infrastructure sectors.

Given the substantial volumes and distances involved, these transport solutions will likely involve a combination of pipelines, rail links, and shipping facilities tailored to the specific needs of each plant. This infrastructure is particularly crucial for cement plants in rural or dispersed areas, which may be far from potential storage sites or industrial hubs.

The benefits of developing this infrastructure extend beyond the cement industry. By creating shared CO_2 transport networks and storage capacities, we can facilitate broader carbon reduction efforts across multiple industrial sectors. A coordinated approach involving all stakeholders is essential to map and develop these networks, ensuring they align with both onshore and offshore storage capacities. Additionally, integrating these efforts with related infrastructure developments, particularly those in the hydrogen sector, can further amplify the impact of these initiatives.

It is critical that the CO_2 storage infrastructure (both storage and transport) respects the principles of transparency and third-party access, to offer to customers fair market access conditions. Fair and open access to CO_2 storage infrastructure should be ensured.

Accessible decarbonised electricity

CCUS has significant electrical demand and therefore a robust policy framework is required to make electricity with low carbon footprint widely accessible at low cost.

Use of carbon, and carbon accounting

Whilst storage presents its own challenges, there also needs to be a significant investment in use options for captured CO_2. The opportunity exists to create new industrial symbiosis relationships, with other sectors taking CO_2 supplied from the cement sector to produce products substituting more carbon intensive ones (e.g., e-fuels).

The business case for deploying these technologies rests heavily on the ability for installations that capture CO_2 to discount it from their emissions, whether used for permanent geological storage, for mineralisation or for the production of products substituting more carbon intensive ones. Where biogenic material is used in the energy fuel mix and its emission captured and permanently stored (i.e., BECCS), the resulting negative emissions must be recognised in the accounting. This acknowledgement of the negative emissions should be in industrial accounting for plants, companies and at country level, as well as at product level in Environmental Product Declarations which are used in the construction sector for low carbon procurement.

Public acceptance

CCUS, like many new technologies, can face opposition by the public due to an understandable lack of knowledge about its technical maturity, its benefits and proven safety. In particular, if these are land-based then there will need to be a public acceptance of the solution; this will need politicians and communities alike to be supportive, backed by appropriate legal mechanisms.

Liability

To facilitate long-term storage, other issues such as liability for the CO_2 need to be resolved. It is preferable if these types of liabilities are public or shared, as with interesting planned models in the UK; otherwise it will place an unaffordable burden on the sector.

Demand for low carbon products

The long-term success of CCUS is highly dependent on the procurement, regulatory and standardisation frameworks that will lead to a market transformation and establishes market demand for the very low carbon products which CCUS will enable. The emission methodologies used for procurement (Environmental Product Declarations) should recognise carbon capture.

Policy recommendations

1. Use appropriate **carbon pricing** mechanisms to create a level playing field on carbon costs and avoid carbon leakage.
2. Integrate CCUS in **public financing** mechanisms that covers in particular the initial investments, including feasibility and operational abatement costs to allow for an investable business case.
3. Provide **fair recognition of carbon removal** measures, both where the CO_2 is ultimately stored or used in products, either by acknowledging them as part of regional/national emission trading systems or by developing tailored accounting rules. Include negative emission savings through the use of CCUS combined with biomass fuels in the accounting rules.
4. **Provide transport infrastructure and storage infrastructure** to move captured carbon to places where it can be used or stored. In particular, speed up the permitting processes to allow for the construction of carbon capture, transport and storage facilities.
5. **Provide regulations and/or a regulator(s) for CO_2 transport** (pipeline networks and other transport) to set standards, ensure fair access and reduce risks. In

addition, the infrastructure needs to be regulated in such a way that dispersed sites are not disadvantaged when it comes to access and costs.

6. **Provide regulatory guidance and harmonisation on CO_2 quality and standards**, as these underpin CCUS project design and enable project implementation.
7. Provide reliable access to sufficient and competitively priced **decarbonised energy**.
8. Establish **public-private partnerships** to speed-up CCUS developments, including shared investment in CO_2 transport and storage networks.
9. **Support R&D** including cross industry collaboration for carbon capture technologies and new uses in other sectors of CO_2 captured by the cement and concrete industry.
10. Enable the integration of CO_2 performance in public procurement, building standards and construction codes alongside traditional criteria (e.g. technical performance) to **create the demand for near zero carbon products**.
11. Implement **public engagement strategies** to educate communities about the benefits and safety of CCUS technologies, addressing any concerns that may arise. Implement robust practices to demonstrate the effectiveness of CCUS initiatives. This will be crucial for compliance and for attracting investment.

Our Commitments

1. Continue to invest in R&D through the GCCA Innovandi platform - both research (Innovandi GCRN) and start up accelerator initiative (Innovandi Open Challenge).
2. Continue and scale up investment in sole-company and multi-company CCUS projects, building on the 29 reported in the "*GCCA 2050 Cement and Concrete Industry Roadmap to Net Zero Concrete*".
3. Apply carbon capture technology at industrial scale at ten plants, thereby contributing to delivering net-zero concrete, by 2030.