

Accelerating CCUS in hard-to-abate sectors and in the Gulf Region

Workshop by the Clean Energy Ministerial CCUS Initiative
Wednesday 15 January 2020
Hotel Andaz Capital Gate, Abu Dhabi

Workshop summary



On Wednesday 15 January 2020 the Clean Energy Ministerial CCUS Initiative organised a workshop on CCUS in hard-to-abate sectors and in the Gulf Region. Hosted by the Ministry of Energy and Industry of United Arab Emirates, the event was held in the sidelines of the World Future Energy Summit in Abu Dhabi.

The workshop had two parts, the first on particular challenges with CCUS in energy-intensive industry, and a second on closer CCUS collaboration in the Gulf Region, following from an earlier event held in Abu Dhabi in September. Workshop participants were from governments in the region, other Clean Energy Ministerial CCUS Initiative governments, from various industries in the region and beyond, academia, as well as from key organisations such as the Carbon Sequestration Leadership Forum, Global CCS Institute and the UNFCCC Secretariat.

Dr. Matar AlNeyadi, Undersecretary for Energy at the UAE Ministry of Energy and Industry welcomed the participants to the event. He highlighted the role of CCUS as a tool and solution for a sustainable energy future. He also stressed the idea of circular economy and the need to use the captured CO₂ whenever possible and sustainable.

Session one: CCUS in energy-intensive industries

The first session, moderated by Stig Svenningsen from the Norwegian Ministry of Petroleum and Energy included a global overview of CCUS projects, interventions from steel and cement sectors and a discussion with all workshop participants. Key salient points included:

- The Global status of CCUS is improving. Altogether 51 projects are today in various stages of development, 19 of which are in operation. The project pipeline is currently replenishing, which is a marked change from the situation 3-4 years back. Developing CCUS clusters as opposed to individual point-to-point projects is becoming the new paradigm in project development. Government policy development has also accelerated, which gives a more positive outlook for new CCUS projects.
- The steel sector produces 1.8Gt of steel every year, and roughly two tonnes of CO₂ per each tonne of steel, making it a sector responsible for 7-9% of global CO₂ emissions yearly.
- The steel sector is characterized by low margins and international trade, which means that passing costs through to customers is very challenging.
- Decarbonising steel production can happen through various routes, CCUS being one of them, most often associated with the option to retrofit existing production capacity.
- The world's first steel-sector CCUS plant is in UAE, the Al Reyadah plant. Using amine-based capture process, it has the capacity to capture 800ktpa CO₂, and could probably increase this to 1Mt.
- The cement sector is similarly competitive, but to a less extent globally traded. CO₂ is produced either directly through the clinker manufacture in the kilns, and indirectly via utilities, power etc. There are several pilot and test projects in the sector worldwide. ¼ of the CO₂ emissions in Saudi Arabia are from industry, including cement, which emits in the order of 80Mt per year. The Saudi cement sector representatives stressed that carbon capture is a key technology and will support the sustainability of the sector and circular economy in general. It is unlikely to be a short-term solution, however it should play a role mid-term. It was also stressed that a "CO₂ value chain" needs to be created in the context of circular economy.

After opening views by the panel, a general discussion followed on how to accelerate CCUS in hard-to-abate sectors.

- Production assets in the hard-to-abate sectors are long-lived, and often are in constant progress: some parts of the plant are being updated or replaced nearly constantly.
- The age of the steel plants is a key factor. New steel plants are mainly in developing economies → there could be a big opportunity for them to use CCUS, as they are likely to remain in service for several decades to come. For older steel plants, building new plants with other technologies will likely be competitive compared to CCS.
- Energy-intensive industries are in many cases in global or at least cross-border competition. Ensuring a sector's and a country's competitiveness and not harming end-consumers are key considerations for the policy-makers.
- The EU's plan to establish "environmental borders" was cited as an example of a mechanisms that may help protect industry in a given geographical region with more stringent CO₂ reduction rules.
- Common-carrier CO₂ infrastructure and the development of hubs would be particularly helpful for energy-intensive industries. In most cases they have no expertise nor interest in being involved in transporting and storing CO₂, but would rather deliver it at the plant gate for transport and storage (or for sale for a particular utilization). Cluster approach, as led by the Porthos (NL) and Teesside (UK) projects was highlighted.

- The theme of consumer demand was also raised during discussion. Could there be enough demand by various types of customers for low- or zero-emission steel and cement? Currently such demand is not there, however it could be stimulated via public procurement rules and other government policies.
- Driving value from CO₂ was also mentioned. This can of course mean EOR, particularly in the Gulf Region where significant opportunity exists, but also other uses where CO₂ is transformed into products.
- A point was also made regarding the close link between CCUS and hydrogen. H₂ is driving more and more interest, and coupling CCUS to this discussion is necessary.
- Finally, it was stressed that finding industry champions is critical for the success of CCUS.

Session two: CCUS collaboration in the Gulf Region

The second part of the day, moderated by Mr. Kamel Ben Naceur, discussed how the Gulf Region countries could collaborate more actively in the area of CCUS. The session was organised as a follow-up to a previous workshop, held in Abu Dhabi in September 2019.

The session started with brief presentations from UAE, Saudi Arabia and Bahrain on their past experience and future visions for CCUS.

- The **United Arab Emirates** has been active in CCUS for over twenty years, starting from subsurface studies, the first CO₂-EOR pilot test in the region, and moving to the full-scale Al Reyadah project which started operation in 2016.
- In the UEA CCUS is strongly linked to EOR, with the national strategy to achieve 70% recovery of oil from its fields in a profitable manner.
- ADNOC's vision is that by 2025, an incremental 4.2 Mtpa of CO₂ will be separated from two main sources to boost EOR:
 - Shah: 2.3Mtpa and
 - Habshan-Bab: 1.9Mtpa
- This would bring the annual capture and injection to 5Mt by 2025 in UAE.
- In **Saudi Arabia**, CCUS is also linked to the country's energy and environment challenges and imperatives.
- Existing experience comes from Aramco's Uthmaniyah CO₂ capture project, capturing and injecting 800ktpa CO₂ for EOR, as well as from SABIC's Jubail plant that captures 500ktpa for methanol and urea production and for a number of other high-purity uses.
- Circular carbon economy is a key point in Saudi Arabia's strategy going forward and it is generally expected that CCUS can unlock significant economic value.
- Matching future capture sites with utilization and permanent storage sites is also being undertaken.
- In **Bahrain**, it is also thought that CCUS will be a key enabler for the increased oil and gas production in the kingdom, and for the long-term sustainability of its economy.
- Bahrain is currently looking at an EOR opportunity that could grow to a level of 500ktpa of CO₂ injected over the next years. The CCUS – hydrogen nexus is also important.

After country briefings, the rest of the session discussed how the Gulf Region countries could best collaborate on CCUS going forward.

- As regards the contents of collaboration, the session moderator recalled the points made at the September 2019 workshop:
 - Developing a **regional strategy** for CCUS as a whole, potentially with joint deployment targets;
 - Jointly identifying **regional hubs**, clusters and key project opportunities for CCUS;

- Providing a joint regional **atlas** for permanent CO2 storage (and EOR as much as possible);
 - Developing **joint approaches in policy** and aligning policy frameworks. This could include considering a regional “Club” that could exploit joint incentive policy frameworks under the Paris Agreement Article 6;
 - Jointly **planning infrastructure** to link capture hubs to storage / injection areas in the region.
- The above points were seen to remain highly relevant.
 - Article 6 under the Paris Agreement provides a mechanism for countries to collaborate including market-based and non-market-based approaches. This article should be seen as an enabler for countries with joint interests to establish common policy frameworks. While the UNFCCC negotiations on Article 6 are still ongoing (expectations for Glasgow COP-26 to deliver a solution), nothing stops Parties from starting collaboration if they so wish.
 - Reference was also made to recent analysis undertaken by the World Bank and the International Emissions Trading Association, which concluded that trading mechanisms can result in significant economic gains to Parties involved.
 - The Gulf Region countries have been active proponents of trading mechanisms and would be well placed to consider how CCUS could be commonly advanced with Article 6 –driven collaboration.
 - As regards the form of future dialogue, it was felt that “nothing is stopping” the region from collaborating, but the right kind of dialogue simply needs to be organized, the present workshop being the first step.
 - A CCUS group is now scheduled to meet under the auspices of the Gulf Cooperation Council during February 2020 to advance the discussions. A suitable task force could then be formed to drive further collaboration, by bringing all key entities in the region together.
 - The role of the Clean Energy Ministerial was also highlighted and the CCUS Initiative is ready to help drive collaboration forward in the region if requested.

The event finished with a presentation by Jarad Daniels of US Department of Energy, on the recently released United States National Petroleum Council (NPC) CCUS roadmap. The roadmap serves as an example of a recent national vision document, and could as such provide inspiration for Gulf Region collaboration.

- In 2017, the US Secretary for Energy asked NPC to define potential pathways for deploying CCUS at scale; the NCP study took 18 months and involved 300+ experts from various industries, and also from outside the United States.
- The roadmap charts a pathway to multiplying the current CO2 capture of 25Mtpa in the US up to 500Mtpa, in three phases:
 - In the “Activation Phase” over the next 5-7 years, CCUS capacity could double to ~60Mtpa, essentially by making full use of the 45Q tax credit mechanism;
 - In the “Expansion Phase” over the next 15 years, CCUS could grow up to 150Mtpa by using economic incentives going up from 50 to 90USD/t;
 - In the “At-scale Deployment Phase”, over the next 25 years, CCUS could reach a 500Mtpa level, through incentives worth up to 110USD/t.
- The ramp-up vision of the roadmap is backed by extensive analysis of technologies in capture, transport, storage and CO₂ utilization.
- The roadmap and the supporting documents are available here: <https://dualchallenge.npc.org/downloads.php>

The CEM CCUS Initiative wishes to thank the government of United Arab Emirates for hosting this event. We also thank all participants for their very active participation!

This note was drafted by Mr. Juho Lipponen, Co-ordinator of the CEM CCUS Initiative. The interpretations and conclusions are intended to reflect consensus in the meeting, but are not annotated to any particular person or organisation.

For any comments or questions, please contact juho.k.lipponen@outlook.com.



Annex 1. Workshop agenda



“Accelerating CCUS in hard-to-abate sectors and in the Gulf Region”

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DRAFT WORKSHOP AGENDA

- 08:30 Registration & welcome coffee
- 09:00 Welcome and opening
- 09:10 Panel discussion: Accelerating CCUS in hard-to-abate sectors

Industry today accounts for 25% of global CO₂ emissions and a number of sectors such as cement, steel and chemicals are among the hardest to decarbonise. This panel discussion explores the state of play and discusses aspects hindering progress, specific policy approaches and mechanisms to join forces to accelerate CCUS in hard-to-abate sectors.

Panelists in this session are:

- Åsa Ekdahl, Head of Environment and Climate Change, Worldsteel
- Brad Page, Chief Executive Officer, Global CCS Institute
- Hassan Shashaa, Chief Operating Officer, Emirates Steel
- Majed Abdulrahman Alosailan, Chief Executive Officer, City Cement Company

- 11:00 Coffee break
- 11:30 Focus on CCUS in the Gulf Region

This session will start with presentations on CCUS visions in countries in the Gulf Region, notably United Arab Emirates, Saudi Arabia and Bahrain. After forward-looking country visions, this session moves to a panel discussion on regional collaboration and how to accelerate CCUS in the Gulf Region employing a more holistic regional approach. How can the region come up with a common strategy? Can a joint roadmap or vision be identified and implemented? (Lunch is served 12:30 – 13:30.)

Presenters and panellists in this session are:

- Khalid Kuleib, Senior Vice President R&D, ADNOC
- Tidjani Niass, CCUS Lead, Saudi Aramco
- Hussain Makki, Senior Advisor, Bahrain National Oil and Gas Authority
- Further discussants and participants will be the speakers from the morning session, as well as representatives from governments, industry and finance sector in the Gulf Region, Gulf Cooperation Council, academia, UNFCCC Secretariat and other organisations.

- 15:30 Example of a national vision: The US National Petroleum Council CCUS Roadmap
- Jarad Daniels, Director, Department of Energy, United States (by phone)
- 15:55 Final remarks by meeting chair
- 16:00 Close of workshop