



## Summary of the Technical Group Videoconference Meeting

Hosted by Delegation of Saudi Arabia  
30 September 2020

*(note: PDFs of all presentations are available at the CSLF website:  
<https://www.cslforum.org/cslf/Events/VirtualTGMeeting2020>)*

### 1. Meeting Host's Welcome

Following a short video about Saudi Arabia and its CCUS activities, Hamoud AlOtaibi, representing meeting host Saudi Arabia, welcomed attendees to the Technical Group's videoconference meeting and described protocols on how the meeting would be conducted.

### 2. Welcome and Opening Remarks

The Chair of the Technical Group, Åse Slagtern (representing Norway), called the meeting to order and welcomed the CSLF delegates and stakeholders. In all, there were 51 people who registered to attend this meeting. This includes 27 Technical Group delegates representing 17 CSLF member governments.

### 3. Status of CCUS in Saudi Arabia

Fareed AlAsaly, representing Saudi Arabia's Ministry of Energy, gave a short presentation which described CCUS in Saudi Arabia in the context of the Circular Carbon Economy (CCE). Saudi Arabia has endorsed the CCE with its "Reduce, Reuse, Recycle and Remove" framework in recognition of the importance of reducing greenhouse gas emissions. In the context of CCUS, "Reduce" lessens the overall amount of CO<sub>2</sub> emissions entering the system (e.g., by having greater energy efficiency), "Reuse" converts CO<sub>2</sub> to another useful industrial feedstock, "Recycle" allows for conversion of CO<sub>2</sub> through natural processes (e.g., bio-energy), and "Remove" prevents CO<sub>2</sub> from entering the environment (e.g., by utilizing CCS). Saudi Arabia is promoting an overall pragmatic approach which addresses emissions while generating value (e.g., employment) and overall sustainable economic growth. Dr. AlAsaly stated that CCE opportunities abound and are not limited only to those involving technology and innovation. The "accelerator" for promulgating the CCE in Saudi Arabia has three components: national level planning, regional/international partnerships, and enabling mechanisms such as innovative business models. Dr. AlAsaly concluded his presentation by stating that the G20 has endorsed the CCE platform as a framework to advance sustainability.

Abdulaziz Al-Qasim, representing project sponsor Saudi Aramco, then gave an overview presentation on the status of the CSLF-recognized Uthmaniyah CCUS Demonstration Project. This project is part of Aramco's overall environmental stewardship activities, which include the focus areas of stationary & mobile carbon management, industrial applications, CO<sub>2</sub> storage, and CO<sub>2</sub> enhanced oil recovery (CO<sub>2</sub>-EOR). The Uthmaniyah Project is the first CO<sub>2</sub>-EOR project in Saudi Arabia and captures approx. 800,000 tonnes of CO<sub>2</sub> per year, transporting the CO<sub>2</sub> via a 85 kilometer pipeline to the injection site.

The project began injecting CO<sub>2</sub> in 2015 is now in the midst of its demonstration and evaluation phases. Ongoing monitoring and surveillance (M&S) activities include continuous seismic monitoring with 1000 seismic sensors which track plume propagation. Data is routed to a control center for 24/7 monitoring by a team of highly-qualified experts. Dr. Al-Qasim concluded his presentation by stating that the Uthmaniyah project has received many awards for engineering innovation and excellence and has been a centerpiece of Aramco's carbon management strategy.

Pieter Smeets, representing project sponsor SABIC, concluded this agenda item by providing a short summary of CO<sub>2</sub> capture and utilization (CCU) activities at SABIC, including the CSLF-recognized CO<sub>2</sub> Network Project. CCU is part of SABIC's overall strategy for sustainability. The CO<sub>2</sub> Network Project includes the world's largest CO<sub>2</sub> purification and liquefaction plant, having a 500,000 tonnes yearly capacity, with the CO<sub>2</sub> being pipelined to industrial facilities which convert it to value-added products such as alcohols, urea, syngas, polymer precursors, and fuels. Dr. Smeets ended his presentation by mentioning that the CO<sub>2</sub> Network Project is still, in effect, a work in progress as further innovation is still needed in the areas of catalyst design for greater process efficiency, process design for integration into existing processes, and finding ways to obtain a relatively inexpensive source of bulk hydrogen for use in converting CO<sub>2</sub> into chemicals and fuels.

#### **4. Update from the Clean Energy Ministerial CCUS Initiative**

Juho Lipponen, Secretariat of the CEM CCUS Initiative, made a short presentation which described the 11<sup>th</sup> CEM meeting, provided an overview of CEM CCUS Initiative activities since January 2020, and shared key points from the CEM CCUS Initiative meeting that had been held on September 28-29. The 11<sup>th</sup> CEM meeting was hosted by Saudi Arabia via live webcast on September 15-22 and included 16 pre-events, one of them themed on "Key Financing Principles for CCUS". Target groups for that pre-event were governments, industry, and the financing sector, with an objective of supporting the establishment of a business case for CCUS and facilitating financing. Mr. Lipponen stated that CCUS was, in general, very visible at the 11<sup>th</sup> CEM with twelve different Ministers mentioning CCUS in their interventions.

Mr. Lipponen then stated that there had been many CEM CCUS Initiative activities since January. Key work items have included collaborations with the Oil and Gas Climate Initiative (OGCI) in an April workshop on "Kickstarter" initiatives, on financing, and on identifying opportunities for CCUS hubs; and launching the "Finance Sector Lead Group for CCUS" which has involved 15-20 banks so far. There have also been several webinars organized by the Initiative themed on various CCUS topics as well as two yearly meetings and eight monthly meetings. The CEM CCUS Initiative also publishes a quarterly newsletter and is active on social media.

Mr. Lipponen provided a brief description of what had occurred during the CEM CCUS Initiative's two-day meeting earlier in the week. One of the highlights was a consensus to activate links with hard-to-abate sectors such as cement production and steelmaking, both of which had previously expressed interest to collaborate on CCUS-related topics. The Initiative will also continue its active collaboration with OGCI and will push forward with liaising with financial sector banks and institutions. Regional approaches are being advanced as well, including work on business models and engaging with CSLF stakeholders. This latter activity had earlier been transferred from the CSLF Technical Group to the CEM CCUS Initiative.

Mr. Lipponen finished his presentation by providing the Technical Group with some advice to help with planning the next CSLF Technology Roadmap (TRM). The CEM CCUS Initiative considers a new “refresh” of the TRM (which had last occurred back in 2017) a good idea and recommends adding the year 2050 as a new timescale in addition to the ones that already are being featured. A new focus area should be Hubs and Clusters. Mr. Lipponen stated that it is important that the new TRM be actively communicated to policymakers and key groups, and suggested an April 2021 publication date that would coincide with the 12<sup>th</sup> CEM meeting.

## **5. Update on the CSLF Projects Interaction and Review Team (PIRT)**

United States delegate and PIRT Co-Chair Sallie Greenberg gave a short presentation that described how the PIRT would function in the future as a permanent standing committee of the Technical Group. There previously had been consensus that the PIRT should be “reimagined” in its overall functionality in order to reinvigorate project recognition activities within the CSLF, to reinforce the value of CSLF-recognized projects to stakeholders (in particular the CEM), and to revisit the process on how projects are selected for maximizing the usefulness of the project recognition process to both the CSLF and the projects themselves. Prior to the April 2019 Technical Group meeting, previous PIRT Chair Martine Woolf (from Australia) had documented these ideas in a short paper (“Reimagining the PIRT”) for that meeting that is also a background document for this current meeting.

To provide more details, Dr. Greenberg stated that “reinvigorate” means a targeted approach to project recognition with projects being selected for their variety in terms of CCUS technologies utilized with first-of-a-kind projects which address strategic challenges attracting special interest. CSLF delegates would be encouraged to proactively identify and recommend such projects, and stakeholders who manage CCUS projects would be encouraged to self-nominate. “Reinforce” would encourage data sharing while identifying opportunities to highlight recognized projects. Additionally, a periodic survey of projects would add to the internal value of recognition. Previously, the project recognition process had proved to be a bit cumbersome with some unnecessary duplication. A streamlining of procedures going forward will minimize duplication and allow additional time at Technical Group meetings for invited presentations and other content.

Dr. Greenberg then summarized the objectives of the ‘new’ PIRT:

- Revitalize and increase momentum for the PIRT;
- Facilitate the next set of projects by providing resources and connections with previous/current projects;
- Leverage learnings from R&D and commercial projects;
- Align projects with CSLF knowledge sharing platform; and
- Act as a resource and facilitator for newly joined projects.

Next steps would include a review of the portfolio of current CSLF-recognized projects as well as the presently-used selection process in order to make it a bit less burdensome for projects to be nominated and recognized. There would also be a greater effort to gain insights into learnings, pitfalls, and successes, even if projects do not go to completion, collecting learnings all the while. Dr. Greenberg recommended that the PIRT not hold separate meetings from the Technical Group, instead conducting most of its business outside Technical Group meetings and having a large enough agenda item, in terms of

time, to both report its activities and to do final review of any nominated projects, including invited presentations from these projects. Dr. Greenberg ended her presentation by mentioning a few possible future activities for the PIRT. These include organizing knowledge-sharing events of various kinds, creating a CSLF-based project network that would be modeled after the existing International Test Center Network, and developing new approaches for engaging CCUS commercial and R&D projects.

Ensuing discussion provided consensus for the ‘reimagined’ PIRT to implement new procedures and proceed with proposed activities as described in Dr. Greenberg’s presentation. In particular, Ceri Vincent mentioned that the CO<sub>2</sub>GeoNet Association would have some suggestions for new projects once the PIRT’s revised onboarding criteria are in place and Frank Morton of the United States National Carbon Capture Center stated that the Center is willing to participate and that he already sees some opportunities where it could do so.

## **6. The Next CSLF Technology Roadmap**

Norway delegate Lars Ingolf Eide, who was editor-in-chief for the current version of the CSLF TRM, gave a short presentation that defined the need as well as the timing for the next version of the TRM. The TRM is a necessity because it contributes to the common understanding among the CSLF and CEM CCUS Initiative on the role of CCUS in a decarbonizing society, on the overall global status of CCUS, and of important and necessary developments to speed up implementation of CCUS. The TRM helps countries that are developing national strategies on CCUS and can be an important tool in communicating the need and role of CCUS. Mr. Eide stated that the present version of the TRM dates back to 2017 and is in need of update for several reasons but mainly because the interest in CCUS has shifted from pure technology development to integration and utilization issues, and that new reports from the IEA and the IPCC (some with new scenarios) may require the CSLF to revisit and perhaps revise recommended emission targets for benchmark dates shown in the current TRM.

Mr. Eide then described the possible content of a revised TRM. Included will be a summary and recommendations section with revised targets, an introduction (which probably would not be much changed from the 2017 version), a brief summary of the role of CCUS (e.g., from new scenarios), a brief status of CCUS globally, and individual sections on the following issues surrounding CCUS:

- Hydrogen and CCUS (i.e., ‘blue’ hydrogen);
- CCUS for industrial clusters (including any needed transport and storage infrastructure);
- Utilization options (including techno-economic-environmental assessments);
- Negative emissions, including Direct Air Capture (DAC) and Bio-Energy with CCUS (BECCS) and techno-economic-environmental assessments; and
- Emerging and enabling technologies (e.g., robotic autonomous systems, manufacturing, digital, VR/AR, sensors, manufacturing, materials).

Mr. Eide closed his presentation by briefly describing the methodology to be used in the new revision and also the timeline. As with previous version of the TRM, the new version would be based on existing knowledge (including the new IEA and IPCC reports mentioned above as well as other sources) while taking into account relevant national CCUS strategies. The editorial committee will be the Technical Group’s Executive Committee with Norway again serving as editor. Input from CSLF delegates will not only be

welcome but also will be actively solicited. As for the overall timing, a list of content is expected to be finalized by late November with a first draft ready by mid-March. A final draft would be expected before the end of March with the final document launched by mid-April, in time for the next CEM meeting.

Ensuing discussion provided consensus for the Technical Group to proceed with the new version of the TRM as described in Mr. Eide's presentation. Tim Dixon stated that the IEAGHG is willing to assist, and this was welcomed by Mr. Eide. Technical Group Chair Åse Slagtern requested that anybody who has further comments should send them to her by the end of the current week.

## 7. Technical Group Strategic Planning

United States delegate Mark Ackiewicz gave a brief presentation that described the current status of the Technical Group, in order to set the stage for discussion in the following three areas:

- How can the Technical Group contribute to broader CCUS discussions?
- What can the Technical Group do to facilitate advancement of CCUS by industry and governments?
- To those ends, what new Technical Group activities would be useful? What and where are the opportunities?

Mr. Ackiewicz stated that currently, the Technical Group has input to the CEM via "Message to Ministers" documents and has a spot on the agenda during CEM CCUS Initiative meetings. Additionally, there are ongoing collaborations with two allied organizations, the IEAGHG and the CO<sub>2</sub>GeoNet Association, in the form of co-sponsored workshops. The Technical Group has also, in the past, submitted proposals for studies to the IEAGHG. Besides co-branded workshops and webinars, Technical Group activities include task forces for investigating various technical challenges concerning CCUS and involvement with independent networks (such as the International Test Center Network) which have been established on the recommendation of the CSLF. And last but far from least, Technical Group semiannual meetings have been content rich with many invited presentations about CSLF-recognized projects and CCUS-related technologies.

Mr. Ackiewicz ended his presentation by providing areas for ensuing discussion:

- What would it take to advance/commercialize/make relevant CCUS in CSLF member countries (besides funding)?
- What R&D or other technical activities would be of interest to CSLF member countries?
- How can the CSLF facilitate collaborative R&D and also meaningful country-to-country or even multiple country engagement?

Group discussion which followed attempted to focus on potentially meaningful outcomes. Due to limited time available, this mainly centered around two broad areas: continuing collaboration with allied organizations and capacity building toward developing countries. Katherine Romanak, representing the Bureau of Economic Geology at the University of Texas's Jackson School of Geosciences, strongly urged the Technical Group to ramp up CSLF capacity building activities as there is a great need for increasing developing countries' technical expertise. Jarad Daniels, representing the CEM CCUS Initiative, replied that all remaining CSLF capacity building money had been transferred to the CEM following the 2018 CSLF Annual Meeting and is now being administered by the IEA. Juho Lipponen added that a considerable amount of that money was still

unallocated. Mr. Daniels offered that the CEM CCUS Initiative was open to discussion on how to proceed and that this would be a good use of both organizations' time and effort. In the end there was consensus that the Technical Group will re-open discussions with the CEM CCUS Initiative on how to better engage developing countries at the technical level. This is expected to become a topic of future Technical Group meetings.

Concerning continuing engagement with other organizations, Ceri Vincent, representing the CO<sub>2</sub>GeoNet Association, stated that the CSLF has a valuable role in the broader CCUS conversation and that the CO<sub>2</sub>GeoNet Association was keen to continue knowledge-sharing activities with the Technical Group via future co-branded workshops and similar activities. Netherlands delegate Paul Ramsak and Italy delegate Sergio Persoglia both suggested that the Technical Group step further outside its comfort zone to engage other groups, including perhaps even project developers, to do "deeper dives" into areas of mutual interest such as 'blue' hydrogen production and cluster projects. Åse Slagtern took that opportunity to remind meeting attendees of the upcoming CSLF co-sponsored Hubs and Clusters workshop webinar and that information on how to participate was available at the CSLF website. To that end, the Secretariat was requested to send out a reminder to everyone on the CSLF mailing list.

As this agenda item ended, Mr. Ackiewicz stated that he and Canada delegate Eddy Chui would be following up on suggestions and points of view that were presented.

## **8. Updates from Allied Organizations**

Ceri Vincent, President of the CO<sub>2</sub>GeoNet Association, gave a short presentation about the organization and its activities. CO<sub>2</sub>GeoNet is a pan-European research association for advancing geological storage of CO<sub>2</sub>. Ms. Vincent stated that membership is comprised of 28 research institutes from 20 countries, uniting more than 300 researchers having multidisciplinary expertise needed to address all aspects of CO<sub>2</sub> storage. Ms. Vincent briefly described some of CO<sub>2</sub>GeoNet's activities, including its presence at the COP25 United Nation Climate Change Conference in December 2019 where it hosted a booth in the negotiation zone and was co-organizer of a side event focused on CO<sub>2</sub> mitigation strategies for industry that was held in the European Union's pavilion. Ms. Vincent then briefly described the status of the CSLF-recognized Enabling Onshore CO<sub>2</sub> Storage in Europe (ENOS) project, including its support of Sotacarbo's Fault Lab which is designed to study gas migration processes in faults and to test a wide range of monitoring technologies. The ENOS project is also assisting the Sapienza University of Rome in offering a MSc program in CO<sub>2</sub> Storage. Ms. Vincent concluded her presentation by mentioning that the CO<sub>2</sub>GeoNet Association's annual Open Forum had to be cancelled this year due to the ongoing COVID-19 pandemic, but the organization was still planning to hold a series of online lectures in the coming months that will focus on national strategies toward CCUS, CCUS success stories from around the world, and emerging CCUS technologies which have added value through CO<sub>2</sub> utilization.

Tim Dixon, General Manager of the IEAGHG, then gave a short presentation about the organization and its continuing collaboration with the CSLF's Technical Group. The IEAGHG was founded in 1991 as an independent technical organization with the mission to provide information about the role of technology in reducing greenhouse gas emissions from use of fossil fuels. The IEAGHG's focus is on CCS, and the goal of the organization is to produce information that is objective, trustworthy, and independent, while also being policy relevant but not policy prescriptive. The 'flagship' activities of the IEAGHG are the technical studies and reports it publishes on all aspects of CCS

(more than 350 reports published on all aspects of CCS), the six international research networks about various topics related to CCS, and the biennial GHGT conferences (the one scheduled for 2020 rescheduled to 2021 due to the pandemic). Mr. Dixon stated that other IEAGHG activities its annual International CCS Summer School (though the one this year had to be postponed until July 2021), webinars on various aspects of CCS, peer reviews with other organizations, activity in international regulatory organizations (such as the UNFCCC, the ISO TC265, and the London Convention), and collaboration with other organizations (including the CSLF). The IEAGHG also holds CCS side events at COP conferences, the one for COP25 themed on carbon removal & return and titled “Can CCS decarbonise industry in South America and help the oceans?”. Mr. Dixon mentioned that since 2008 the IEAGHG and CSLF Technical Group have enjoyed a mutually beneficial relationship which allows each organization to cooperatively participate in the other’s activities. This has included mutual representation of each at CSLF Technical Group and IEAGHG Executive Committee (ExCo) meetings, and also the opportunity for the Technical Group to propose studies to be undertaken by the IEAGHG. So far there have been eight IEAGHG studies that originated from the CSLF Technical Group or related activities, including reports on four International Workshops on Offshore Geologic CO<sub>2</sub> Storage. Mr. Dixon concluded his presentation by showing lists of reports recently published as well as recent blogs and information papers.

Jamie Burrows, Client Engagement Manager for the Global Carbon Capture and Storage Institute (GCCSI), concluded this agenda item by giving a short presentation about the organization and its activities. The GCCSI is an international think tank with the overall mission of accelerating the deployment of CCS globally, and currently has 80 members and six regional offices. Mr. Burrows mentioned that services of the GCCSI include research on key aspects of CCS deployment (including publication of an annual “Global Status of CCS” document), advice and capacity building (through tailored workshops, conferences, and presentations to groups such as the CSLF), and communications / advocacy (to build awareness of CCS and its role in achieving climate targets and reducing emissions). Mr. Burrows briefly summarized the global status of carbon capture deployment: as of September 2020 there are 20 large-scale facilities in operation, with another three facilities under construction and 37 facilities in various stages of development. Concerning the GCCSI’s response to the COVID-19 pandemic, Mr. Burrows stated that it is organizing a “CCS Talks” webinar series, will continue its close interactions with GCCSI members and key proponents of CCS, and intends to be actively involved in webinars about various aspects of CCS that are being held by other organizations. Mr. Burrows ended his presentation by highlighting a publication by the GCCSI and Columbia University’s Center on Global Energy Policy titled “Net-Zero and Geospheric Return: Actions Today for 2030 and Beyond”. Some of the conclusions from the report are that global CO<sub>2</sub> emissions must be cut in half by the year 2030 and then have a further 50% cut by 2040 to achieve net-zero by mid-century. CCS must play a large role for this to happen. Increased infrastructure will be essential with, for example, the existing 8,000 kilometers of existing CO<sub>2</sub> transmission pipeline in North America needing to expand to at least 35,000 kilometers. Some good news is that the CO<sub>2</sub> pipeline infrastructure in the United States has exhibited growth, and this has been largely due to enhanced tax credits for large CCS projects. Additionally, the advent of the hubs and clusters approach toward CCS and the continuing need for ‘blue’ hydrogen is creating further opportunities for infrastructure expansion.

## 9. Summary of Meeting Outcomes

The CSLF Secretariat, Richard Lynch, provided a brief summarization of the five outcomes from the meeting. They are listed below.

## 10. Closing Remarks / Adjourn

Technical Group Chair Åse Slagtern thanked Hamoud AlOtaibi and his team hosting this videoconference meeting. Ms. Slagtern also thanked the Secretariat for its pre- and post-meeting support, and the delegates and other attendees for their active participation. She then adjourned the meeting.

### Summary of Meeting Outcomes

- The PIRT will implement new procedures and proceed with proposed activities as described in its presentation.
- The Technical Group will begin activities which will lead to a new TRM by the time of the 2021 Clean Energy Ministerial meeting (currently scheduled for April 2021). The Technical Group’s Executive Committee will be in charge of this activity with Norway acting as editor.
- The Technical Group will re-open discussions on how to better engage developing countries at the technical level.
- Meeting attendees were reminded about the Hubs, Clusters and Infrastructure Workshop Webinar, co-sponsored by the CSLF Technical Group, held on October 15. The Secretariat was requested to send out an email reminder to everybody on the CSLF mailing list.
- The Technical Group’s Executive Committee (specifically the United States and Canada representatives) will be following up on suggestions made during the Strategic Planning agenda item.

