



Minutes of the Technical Group Mid-Year Meeting

Hosted by Delegation of Norway

Bergen, Norway

27 June 2022

1. Welcome and Meeting Protocols

Ms. Åse Slagtern, Chair of the Technical Group, opened the meeting and described protocols on how the meeting would be conducted. The Chair welcomed the CSLF delegates and stakeholders, as part of the 59 participants from 17 countries. The Chair also thanked sponsors, including Equinor, CLIMIT, Celsio, TCM, and Research Council Norway. The meeting agenda was adopted, and minutes from the December 8, 2021, Technical Group meeting were accepted and approved.

2. Meeting Host Welcome

Deputy Director General William Christensen, Ministry of Petroleum and Energy, provided a welcome statement on behalf of the host country, Norway. Mr. Christensen spoke on the encouraging progress of projects globally, noting the changing landscape for CCS, and the effect of climate commitments and initiatives across countries. He then provided a short update on CCUS in Norway, including an overview of Norway's Longship Project.

3. Report from Secretariat

The CSLF Secretariat, represented by Stephanie Hutson, provided a short overview of recent activities, including those from the virtual mid-year and annual meetings in 2021. Notable activities included:

- The CO₂ Hubs and Infrastructure Task Force organized a virtual workshop in October 2020 with a high level of participation, and has provided status reports on this topic, or included the subject into the 2021 Technical Roadmap.
- The Project Interaction and Review Team (PIRT) has been revitalized with new chairs and members, procedures, and work mode. The result was demonstrated at this meeting, where projects were recognized for the first time in more than years.
- Strategic planning started with a questionnaire to members and was finalized with recommendations from the team to the Technical Group. The structure of this and future meetings meeting is based on these recommendations.
- The CSLF Technical Roadmap 2021 was completed in April 2021. It has several changes from the 2017 version, including new time horizons for targets and more qualitative targets. The recommended priority action areas fall into three broad categories:
 - Technology Development, Innovation, and Cost Reduction
 - Strategic Build-out of CCUS Projects and Hubs
 - Development of Strategy, Policy, Legal, and Financial Frameworks

4. CSLF Projects Interaction and Review Team (PIRT)

United States delegate and PIRT Co-Chair Sallie Greenberg noted the new format for PIRT meetings as part of an effort to streamline the process and provided an update on how this process took shape. Following this update on the PIRT, Dr. Greenberg invited three projects to present: CO2MENT (represented by Svante), Porthos (represented by RVO), and Northern Lights (represented by Northern Lights). The three representatives provided overviews of each project, including ongoing activities, challenges, and opportunities. Once the presentations were completed, PIRT delegates then discussed the projects, and following a short discussion, the group agreed to approve them. The Chair proceeded with formally recognizing all three projects as CSLF-Recognized Projects.

5. Invited Presentations

As part of the new meeting format, three organizations were invited to present on projects: Technology Centre Mongstad; Boundary Dam; and Tomakomai. All three are completed CSLF Recognized Projects.

a. TCM, Ismail Shah

Ismail Shah, TCM, provided an overview and introduction to Technology Centre Mongstad. This overview included a brief history of the organization, its current profile, including entities testing at the site, and its advisory services. Established in 2009 as a joint venture, it is now operated by Gassnova on behalf of the Norwegian state (73.9%), and with the minority owners Equinor (8.7%), Shell (8.7%), and TotalEnergies (8.7%). Its key activities include: proprietary testing (over 28,000 hours), non-proprietary testing (over 20,000 hours), and advisory services (recently started, this is offered to project and technology owners). Testing at the site only includes post-combustion CO₂ capture technologies; more than 19 technologies have been tested since 2012. Beyond its testing activities, TCM also provides intelligence for companies to include reduction of HSE, technical, and technology scale-up risks. Mr. Shah ended the presentation by noting key upcoming activities, including technologies expected to be tested.

b. Boundary Dam, Niall Mac Dowell

Niall Mac Dowell, International CCS Knowledge Centre, delivered a presentation on the SaskPower Boundary Dam Carbon Capture Project, starting with a history of the Boundary Dam plant and the development of the capture project. The capture plant, inaugurated in October 2014 on unit 3, demonstrates that CCS is proven. The first million tons of CO₂ was captured by July 2016; to date, it has captured over 4.5 MTCO₂. Dr. Mac Dowell highlighted the significance of support from the federal and provincial governments and key steps in the project's development, while noting some of the challenges this project has faced. Speaking more broadly about CCS, Dr. Mac Dowell noted that developing and delivering CCS projects is not straightforward, as projects must navigate numerous regulatory and environmental challenges. The presentation was concluded with a note on the International CCS Knowledge Centre's ongoing activities, including collecting lessons learned, working with industry, and engaging with technology providers and project developers.

c. Tomakomai, Jiro Tanaka

Jiro Tanaka, Japan CCS, concluded this section with a presentation on the Tomakomai CCS Project. Mr. Tanaka shared a history of the project through its development and operational stages. He noted that

the main objectives and tasks of the project were to: demonstrate a full chain CCS system from capture to storage and to demonstrate the safety and reliability of CCS, including the specific system used for the project. The project achieved over 300,000 of CO₂ injection into two reservoirs at different depths, with monitoring results showing that no micro-seismicity or earthquakes attributable to CO₂ injection were detected in vicinity of injection area. Mr. Tanaka noted that public engagement is a significant component of the project, with the goal of minimizing concerns of local communities through outreach, disclosing information, and staying engaged. Looking ahead, Mr. Tanaka noted that in 2019, the government of Japan planned to utilize the Tomakomai facility to promote development of carbon recycling. He then closed the presentation by briefly providing an overview of Japan CCS' upcoming activities beyond the Tomakomai project.

Following these project presentations, they were all presented with trophies as completed recognized CSLF projects.

6. Learnings from Large-Scale Projects and Pilots

This panel, moderated by Bruno Gerrits of the Global CCS Institute, focused on large-scale CCS projects and pilots and brought together representatives from Boundary Dam (Niall Mac Dowell); Tomakomai (Jiro Tanaka); Northern Lights (Cristel Lambton); Norcem (Per Brevik); and the Alberta Carbon Trunk Line (Candice Paton and Cullen Colville). The panel started with short presentations from the representatives, with panelists then speaking on key project experiences and learnings. Panelists also spoke on challenges that projects faced, including those more specific to a region, a specific project, or other factors. The panelists also highlighted the benefits of knowledge sharing between projects and developers, while recognizing sensitivities and other factors that shape these exchanges.

7. Leverage Research/Laboratory Infrastructure for Upscaling and Standardization of Results from Test Facilities

This panel, moderated by Tim Dixon of the IEAGHG, focused on learnings from research organizations, laboratories, and other stakeholders, with panelists from the International Test Centre Network (Professor Mohamed Pourkashanian), CO2CRC's Otway International Test Centre (Max Watson), TCM (Ismail Shah), CO2GeoNet (Ceri Vincent), and ECCSEL ERIC (Volker Röhling).

Panelists provided overviews of their respective organization, noting unique experiences and lessons learned, while noting similar opportunities and challenges that arose. Through discussion, panelists highlighted numerous opportunities stemming from research networks and similar organizations, including: international collaboration and knowledge sharing; learnings through portfolios of pilot-scale projects; support for RD&D of next generation technologies; and procedures for integrating and leveraging technology tools for common scenarios. Research networks and organizations can also promote the sharing of expertise and experience, an open dialogue and exchange of ideas, impartial science-based advice, best practices and recommendations, and input to policy, where applicable. At the same time, these networks and organizations face such challenges as creating financial sustainability plans and investment strategies; standardizing laboratory tests; and methods of data collection, including identifying the types of data needed, data collection, and applying this to upscaling. As test centers, research networks, and similar organizations continue to evolve, it was noted that they can continue to help developers answer questions, refine best practices, and also offer a platform for public engagement and education.

8. Update from the Clean Energy Ministerial CCUS Initiative

Mr. Stig Svenningsen, CEM CCUS Initiative Co-Lead, made a short presentation describing the Initiative's ongoing activities, highlighting its ongoing activities with the Global Cement and Concrete Association and the Oil and Gas Climate Initiative, along with continued engagement with its Finance Sector Lead Group, and with countries interested in CCUS. Mr. Lipponen also provided an overview of recent outreach activities through the Initiative's webinar series and through engagement with other organizations, such as the United Nations Economic Commission for Europe. Looking ahead, Mr. Svenningsen noted the Initiative's planning for the 13th CEM Ministerial in Pittsburgh, Pennsylvania in September 2022 as part of the Global Clean Energy Action Forum (GCEAF). The Initiative has put forward applications for several-CCUS focused side events, which will take place alongside two CCUS-relevant high-level roundtables on carbon management and industrial decarbonization. In addition to these events, the Initiative is also planning to host its annual meeting at GCEAF, with key agenda items that will include a global CCUS policy roundtable, a session on CCUS in cement, a report out from the CSLF Technical Group, and further CCUS Initiative activity planning. The Initiative continues its engagement and outreach strategy, including with non-member countries; recently, the Initiative welcomed Nigeria as a new member in April 2022.

9. Update on Mission Innovation (MI) CDR Mission

Mr. Mark Ackiewicz, United States delegate, provided an overview of the recently launched mission on carbon dioxide removal (CDR) in Mission Innovation. Launched at COP26 in November 2021, the mission is co-led by Canada, Saudi Arabia, and the United States. The mission has a stated goal of "100 in 10"—enabling CDR technologies to achieve a net reduction of 100 million metric tons of CO₂ per year globally by 2030. Its initial scope is on technological CDR approaches, including Direct Air Capture (DAC), enhanced mineralization, and Biomass Carbon Removal and Storage (BiCRS), with an emphasis on secure CO₂ storage and conversion into long-lived products. The mission's ongoing activities include: methodologies for LCA/TEA; RD&D for lower TRL CDR activities; and sharing lessons learned from first generation CDR projects and business models. Key activities also include the production of an innovation roadmap—mapping existing initiatives and gaps—and the development of a mission action plan. In the near-term, the mission is working toward the GCEAF in September 2022 in Pittsburgh, in addition to continuing building its network and collaborating with country members and partners.

10. CETP Clean Energy Technology Partnership

Dr. Ragnhild Rønneberg, Research Council Norway, presented on the CETP (Clean Energy Transition Program), a new partnership under Horizon Europe that is a consortium of 70 national and regional RTDI (Research, Technology, Development, Innovation) program owners and managers from 32 countries (26 EU member states, 5 associated countries, and 1 associated partner). Its objective is to empower the clean energy transition and contribute to the European Union's goal of becoming the first climate neutral continent by 2050. The CETP will implement annual joint calls from 2022 to 2027, pooling national and regional RTDI funding for a broad variety of technologies and system solutions required for the clean energy transition. The CETP is structured around 7 transition research initiatives (TRIs)—configured by theme—with TRI3 focused on enabling climate neutrality with storage technologies, renewable fuels, CCU/CCUS, and hydrogen. TRI3's research targets include: CO₂ capture, CO₂ storage sites, enabling CCU/CCS technology, transport and injection, and negative emissions. Projects should aim at TRL5 or higher—smaller parts at lower TRL are allowed, and they should provide significant

results to the CCUS domain by 2030. The TRI3 call launches in September 2022; projects will start in September 2023. Dr. Rønneberg invited other countries to join through bilateral agreements.

11. Technical Group Strategic Plan and Future Activities

Ms. Åse Slagtern presented on the 2022-2024 CSLF Technical Group Action Plan, based on the strategy initially presented at the December 8, 2021 virtual meeting by Mr. Mark Ackiewicz, United States delegate, and Dr. Eddy Chui, Canada delegate. As part of the Action Plan, the Technical Group aims to hold meetings in conjunction with other events, CSLF workshops, or CCUS events. If possible, the Technical Group would aim to hold these meetings in conjunction with CEM CCUS Initiative meetings. The Technical Group will also continue collaboration with the CEM CCUS Initiative and expand cooperation with allied and other organizations, including MI, OGCI, ACT, and others. With regard to the Technical Group meeting structure, the meeting will aim to keep administrative and status issues to a minimum, preferably limiting these to one morning or afternoon session. There will be a day to a day and a half devoted to dialogue, discussions, and information sharing on identified targeted subjects, including external experts and panel and roundtable discussions. Ms. Slagtern also noted potential activities, including upcoming topical workshops and ad hoc task forces to support the facilitation of reports, workshops, and other activities, especially on technical areas and topics that were identified as under-represented in the survey. Potential synergies between PIRT and revived Academic Task Forces were also touched upon.

12. CSLF Technical Group Task Force – Updates

Mr. Eric Tenthorey provided a short overview of the following day's CDR Workshop, while Mr. Lars Ingolf Eide shared ideas for a winter workshop (early 2023) focused on the Central and Eastern Europe region, the Hubs and Clusters Task Force, and follow up of the TRM 2021. The final presentation of this session was by Mr. Tim Dixon, IEAGHG, who shared a short update on the 5th International Workshop on Offshore Geologic CO₂ Storage, held in May 2022. The floor was then opened for a general discussion on future activities, including the role of the task force itself, and potential topics for reports and workshops, including how to best engage with other organizations and their products.

13. Summary of Meeting Outcomes

The CSLF Secretariat, represented by Stephanie Hutson, provided a summary of the key outcomes from the meeting. They are listed below.

14. Closing Statement/Adjourn

Åse Slagtern, Chair of the Technical Group, thanked the Norwegian delegation for hosting the meeting. Ms. Åse 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 Technical Group Chair proceeded with formally approved all three nominated projects as CSLF-Recognized Projects (CO2MENT, Porthos and Northern Lights).
- Completed CSLF projects (TCM, Boundary Dam, and Tomakomai) were all presented with trophies as recognized CSLF projects.

- The CEM CCUS Initiative will discuss CSLF Technical Group readout at the Initiative Annual Meeting.
- Mission Innovation CDR Mission invites interested countries to reach out.
- Delegates will discuss future PIRT and Academic Task Force at the next meeting.
- It was decided as group that the CEM CCUS Initiative should continue the Stakeholder Initiative (transferred earlier from the CSLF Policy Group), and can discuss at the GCEAF.
- Planning on the proposed Central/Eastern Europe-focused workshop, tentatively scheduled for early 2023, will start in late August. The CSLF will contact member country representatives in CEE countries and allied organizations that have shown interest.
- Decision on Hubs and Clusters Task Force and TRM monitoring Task Force: The Hubs and Clusters Task Force will not continue and a separate report will not be issued; rather, the topic will be included in the monitoring report. Mr. Eide can make a proposal on how to craft this document for the CEM CCUS document book, and can aim to have this created in August. The CEM CCUS Initiative can post this 2-pager document to the CEM CCUS webpage to make it more available to a wider audience.