Recent activities of the Technical Group of the Carbon Sequestration Leadership Forum (CSLF)

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The CSLF is an international Ministerial-level climate change initiative whose mission is to accelerate development, demonstration and commercial deployment of improved cost-effective technologies for carbon capture and storage (CCS). It also promotes awareness and champions legal, regulatory, financial, and institutional environments conducive to such technologies.

The CSLF works via collaborative efforts that address key technical, economic, political and environmental obstacles.
About the Carbon Sequestration Leadership Forum, CSLF

- Established in 2003
- 25 member states plus the European Commission
- CSLF member countries represent around 50% of the world’s population and 80% of global man-made CO₂ emissions

Dark blue: Countries individually represented in the CSLF; Green: Member countries of the European Union that are not individually represented in the CSLF
Organisation

CSLF Ministerial

CSLF Secretariat

Policy Group

Technical Group

Chair: USA
Vice Chairs: China, Saudi Arabia, UK

Chair: Norway
Vice Chairs: Australia, Canada, South Africa
Some words on the CSLF Policy Group

The responsibilities include:

- Reviewing programmes and activities
- Govern overall framework and policies
- Make recommendations to the ministers for appropriate action

Present activities and working committees:

- Enhanced communications
- Global collaboration on large-scale CCUS projects
- Financing for CCS projects
- Capacity building
- An academic task force
Technical Group responsibilities

• Identifying key issues related to the achievement of improved technological capacity;

• Identifying potential areas of multilateral collaboration on CCUS;

• Establishing and regularly assessing an inventory of the potential areas of needed research;

• Making recommending to the Policy Group
Technical Group (TG) Activities

- Review and recommend projects nominated for CSLF recognition
- Prepare reports on topics of interest to members (Task Forces)
- CSLF Technology Roadmap (TRM)
- Working with allied organisations IEAGHG, GCCSI, CO2GeoNet

TRM and Task Force reports:
- Based on voluntary contributions from members
- Draw on existing work, including European ZEP, IEAGHG, GCCSI, IEA and national activities
CSLF Recognised Projects

- CSLF Objectives
  - Knowledge sharing
  - Input to TRM and other activities
  - Tracking progress

- Why seek recognition?
  - Get international recognition of and publicity around project
  - Share knowledge
  - Expand international cooperation

Courtesy: Headspin Communication, Trondheim, Norway
CSLF Recognised Projects

- Knowledge sharing:
  - Presentations at CSLF meetings
  - Workshops in connection with meetings

- Reported success factors
  - Encouragement from owners
  - Collaboration and good communication between stakeholders
CSLF Task Forces

- **Objectives:**
  - Present status
  - Identify needs for further work
  - Knowledge sharing
  - Provide input to TRM
  - Recommend actions to ministers

- **Outcomes:**
  - Reports
  - Suggested further studies to e.g. IEAGHG
  - Workshops, e.g. Int. Workshop on Offshore Geologic CO₂ Storage

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**Summary of barriers and recommendations (2)**

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>Lack of business models, also for offshore CO₂-EOR.</td>
<td>Develop business models for offshore CO₂-EOR. Establishing offshore CO₂ networks will create many interdependencies and commercial risks concerning both economics and liabilities. Risk- and cost-sharing will be needed. The literature has a few examples that provide some thoughts, but these need to be matured. The business models must include fiscal incentives, e.g. in term of taxes or tax rebates.</td>
</tr>
<tr>
<td>High investment costs, CAPEX and additional operational costs, OPEX; needs for modifications</td>
<td>Support RD&amp;D to develop new technologies. CAPEX and OPEX are significant due to needed modifications and additional equipment on the platforms to separate CO₂ from the produced oil and gas and to make existing wells and pipes resistant to CO₂ corrosion. New technologies can reduce the need for modifications and new equipment, for example better mobility control or sub-surface separation systems. Use of existing pipelines may also be a way to keep investment costs down.</td>
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### Recent Taskforces by Technical Group

<table>
<thead>
<tr>
<th>Recent and current Taskforces</th>
<th>Lead country</th>
<th>Report Published</th>
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<tr>
<td><strong>Industrial CCS</strong></td>
<td>France</td>
<td>Dec. 2018</td>
</tr>
<tr>
<td><strong>Improved Pore Space Utilization</strong></td>
<td>Australia and UK</td>
<td>Dec. 2018</td>
</tr>
<tr>
<td>Hydrogen Production and CCS, Phase 0</td>
<td>Norway</td>
<td>June 2018</td>
</tr>
<tr>
<td>Bioenergy with CCS</td>
<td>USA</td>
<td>April 2018</td>
</tr>
<tr>
<td>Offshore CO₂-EOR</td>
<td>Norway</td>
<td>Nov. 2017</td>
</tr>
<tr>
<td>CO₂ Storage Efficiency</td>
<td>Canada</td>
<td>Sep. 2015 (IJGGC)</td>
</tr>
<tr>
<td>2nd and 3rd Generation Carbon Capture Technologies</td>
<td>Norway and Canada</td>
<td>Dec. 2015</td>
</tr>
<tr>
<td>Technical Barriers and R&amp;D Opportunities for Offshore, Sub-Seabed Storage of CO₂</td>
<td>USA</td>
<td>Sep. 2015</td>
</tr>
<tr>
<td>CCS Technology Opportunities and Gaps</td>
<td>Australia</td>
<td>Oct. 2013</td>
</tr>
<tr>
<td>Technical Challenges of Conversion of CO₂-EOR Projects to CO₂ Storage Projects</td>
<td>Canada</td>
<td>Sep. 2013</td>
</tr>
</tbody>
</table>
Objective

- Provide recommendations to Ministers of the CSLF countries on technology developments that are needed to accelerate the deployment of CCUS

Audience

- Energy policy developers in general and the CSLF Ministers in particular

Received input from several sources
CSLF Technology Roadmap (TRM) 2017
Contents

- Quantitative targets
  - Storing sufficient CO₂ to meet IEA 2DS by 2025/2035

- Special sections on
  - Industrial CCS
  - BioCCS
  - Infrastructure, hubs and clusters
  - Utilisation
  - H₂ production w/CCS

CO₂ captured and stored per year to achieve the 2DS (after IEA ETP. 2016a)
CSLF Technology Roadmap 2017
Recommendations

- Facilitate CCS infrastructure development
- Leverage existing large-scale projects to promote knowledge-exchange opportunities
- Drive costs down along the whole CCS chain through RD&D (including more detailed technical recommendations in Annex B)
- Facilitate innovative business models for CCS projects
- Facilitate implementation of CO₂ utilisation

- Promote the value of CCS in achieving domestic energy goals and global climate goals
- Incentivize investments in CCS by developing and implementing policy frameworks
- Implement legal and regulatory frameworks for CCS
- Build trust and engage stakeholders through CCS public outreach and education
- Accelerate CCS in developing countries by funding storage appraisals and technology readiness assessments
Use of CSLF Technical Group Documents

• Electronic survey conducted summer 2018. Objectives:
  – Assess impact and usage of Technical Group deliverables, TRM and technical reports
  – Measure use of TRM and progress on its technical recommendations

• Results: TRM
  – Impact/usage: The majority of respondents indicated TRM used for the formation of strategies or RD&D programmes for CCUS
  – Progress vs. recommendations:
    • ≈ 50 % reported infrastructure projects, incentives to implement CCUS, or incentives for knowledge sharing
    • Most reported status quo on RD&D budgets from 2017 to 2018
Results: Use of Task Force technical reports

- The reports most often used for
  - Knowledge and technical gain
  - RD&D program planning
  - Technology assessment
  - Strategic planning

Task Force on Technical Barriers and Research and Development Opportunities for Offshore, Sub-Seabed Storage of Carbon Dioxide (CO2): Final Report (September 2015)
Future plans and the way forward

• Follow up survey responses to
  – Gain more insight into impacts of documents
  – Develop more stringent follow up plans
  – Provide an improved approach to defining new task forces

• Expand co-operation beyond allied organisations
  – Mission Innovation CCUS Challenge
  – Clean Energy Ministerial CCUS Initiative
  – CCS Knowledge Centre
  – International Test Center Network
  – European ACT
  – Others
Summary and Conclusions

- The CSLF Technical Group has
  - Recognized CCS projects around the world
  - Produced a wide range of task force reports
  - Issued several editions of the Technology Roadmap.
- The documents and dissemination of results from the recognized projects have
  - Resulted in knowledge sharing
  - Inspired other studies and international cooperation and conferences.
- The Technical Group continues to evolve its work mode and monitoring of activities to promote accelerated deployment of CCS
Thank you for the attention

CSLF Website: https://www.cslforum.org/cslf/
CSLF Publications: https://www.cslforum.org/cslf/Resources/Publications
Back-ups
The purpose of the Task Force is to highlight

- Main differences between offshore and onshore CO$_2$-EOR
- Issues that are different between offshore CO$_2$-EOR and pure offshore CO$_2$ storage
- New technical solutions that will benefit both pure offshore CO$_2$ storage and offshore CO$_2$-EOR.
Bioenergy with CCS

Lead: United States

Purpose:

- Identify market drivers, barriers to large-scale BECCS demonstration and deployment
- Provide an overview of BECCS technology options and pathways:
- Summarize resource assessments and emissions profiles, including resource assessments; direct and indirect GHG emissions; life cycle assessments;
- Summarize economic analyses for BECCS concepts;
- Identify gaps and future opportunities;
- Make recommendations for overcoming barriers progress.
Current Task Force Activities

Improved Pore Space Utilization

Leads: Australia and the United Kingdom

- A large portion of available pore space in a geological storage site is bypassed.
- Improving pore space utilization may be beneficial in terms of increased storage capacity, reduced monitoring costs, and increased ability for “hub” style storage operations.
- This task force will investigate the various published options and review the effectiveness and readiness of these techniques to improve the pore space utilization.
- The result will be a set of options for stakeholders to develop into their storage projects. CCS and technology gaps or challenges.
Current Task Force Activities

Industrial CCS
Lead: France

This task force will examine the potential for CCS for industrial applications, in particular from the perspective of use of 2nd and 3rd generation CO2 capture technologies. The task force will assess which of these have potential and any specific challenges.

Note: Scope under development
CQLF Recognized Projects

- CSLF purpose Projects must contribute to the overall CSLF goal
- There is no restriction on project type to be recognized as long as the project meets the criteria:
  - An integrated CCS project with a capture, storage, and verification component and a transport mechanism for CO2.
  - Demonstration at pilot- or commercial-scale of new or new applications of technologies in at least one part of the CCUS chain
  - Demonstration of safe geological storage of CO2 at pilot- or commercial-scale.