

Carbon Sequestration leadership forum

www.cslforum.org



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

Åse Slagtern, Andrew Barrett, Noel Kamrajh, Eddy Chui, Max Watson, Brian Allison,
Mark Ackiewicz, Didier Bonijoly, Richard Lynch, Sallie Greenberg, Lars Ingolf Eide

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CSLF Overview



Australia



Brazil



Canada



China



Czech Republic



European Commission



France



Germany



Greece



India



Japan



Mexico



New Zealand



Poland



Romania



Russia



Saudi Arabia



Serbia



South Africa



United Arab Emirates



United Kingdom



United States

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

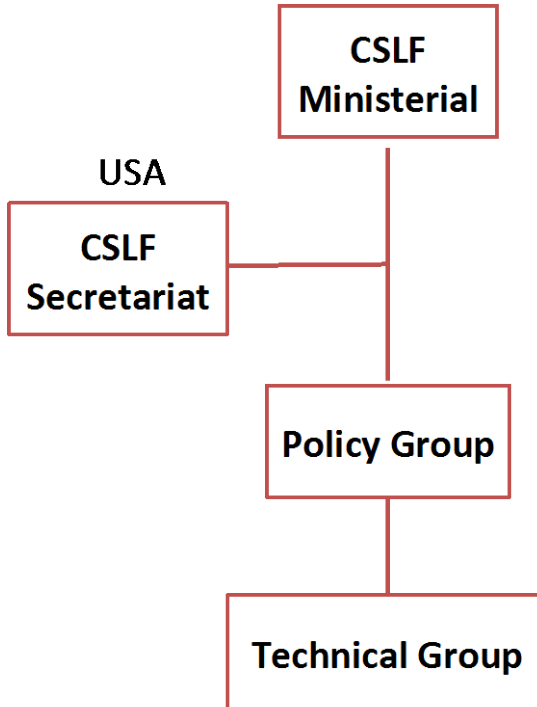


- Established in 2003
- 25 member states plus the European Commission
- CSLF member countries represent around 50% of the world's population and 80% of global man-made CO₂ emissions



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

Organisation



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

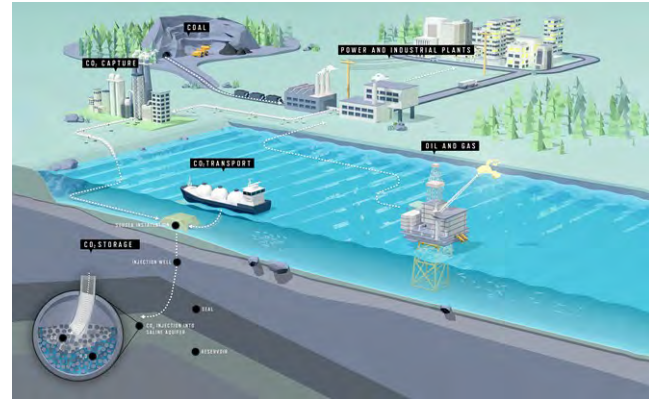
CSLF Recognised Projects

➤ 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)

Barrier	Recommendation
Lack of business models, also for offshore CO ₂ -EOR.	Develop business models for offshore CO₂-EOR. Establishing offshore CO ₂ 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.
High investment costs, CAPEX and additional operational costs, OPEX; needs for modifications	Support RD&D to develop new technologies. CAPEX and OPEX are significant due to needed modifications and additional equipment on the platforms to separate CO ₂ from the produced oil and gas and to make existing wells and pipes resistant to CO ₂ 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.

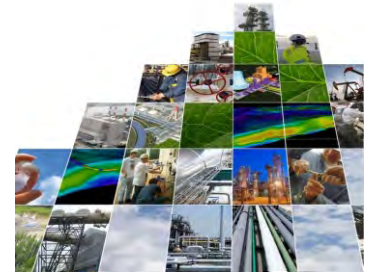
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Recent Taskforces by Technical Group

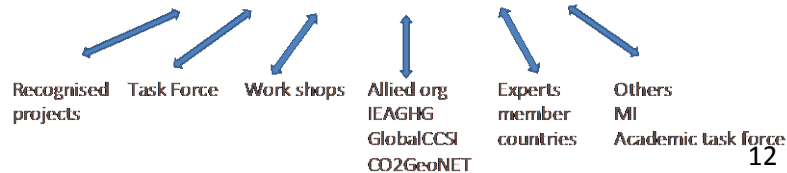


Recent and current Taskforces	Lead country	Report Published
Industrial CCS	France	Dec. 2018
Improved Pore Space Utilization	Australia and UK	Dec. 2018
Hydrogen Production and CCS, Phase 0	Norway	June 2018
Bioenergy with CCS	USA	April 2018
Offshore CO ₂ -EOR	Norway	Nov. 2017
CO ₂ Storage Efficiency	Canada	Sep. 2015 (IJGGC)
2nd and 3rd Generation Carbon Capture Technologies	Norway and Canada	Dec. 2015
Technical Barriers and R&D Opportunities for Offshore, Sub-Seabed Storage of CO ₂	USA	Sep. 2015
Reviewing Best Practices and Standards for Geologic Monitoring and Storage of CO ₂	Norway	Oct. 2013
CCS Technology Opportunities and Gaps	Australia	Oct. 2013
Technical Challenges of Conversion of CO ₂ -EOR Projects to CO ₂ Storage Projects	Canada	Sep. 2013
Utilization Options of CO ₂	USA	Oct. 2012, Oct. 2013

CSLF Technology Roadmap 2017



Technical Group: TRM



- 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
- Receives input from several sources

CSLF Technology Roadmap (TRM) 2017

Contents

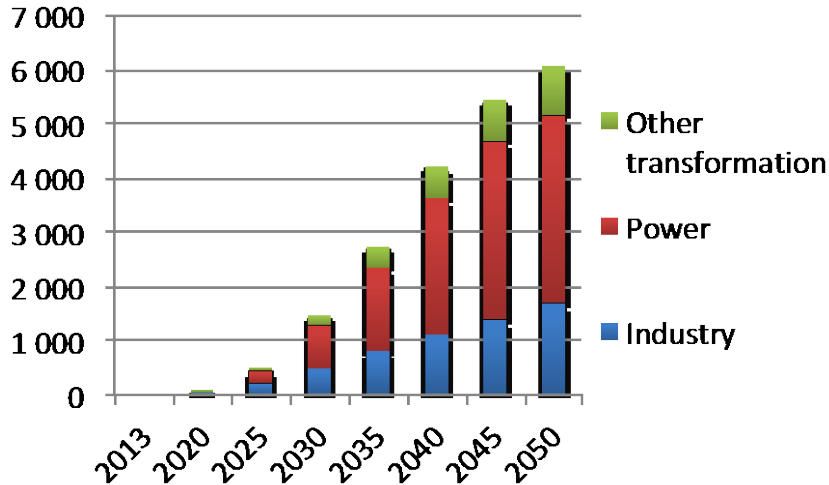


➤ Quantitative targets

- 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:
 - \approx 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

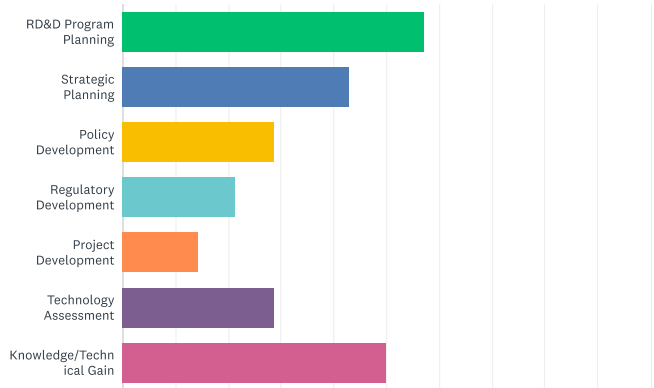
Results: Use of Task Force technical reports



- 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)

Answered: 14 Skipped: 7



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



CSLF Website: <https://www.cslforum.org/cslf/>

CSLF Publications: <https://www.cslforum.org/cslf/Resources/Publications>

Thank you for the attention

Back-ups

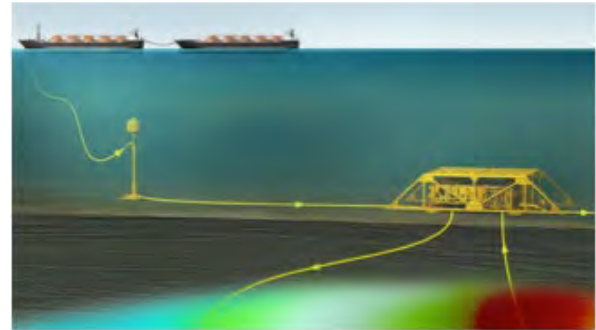
Offshore CO₂-EOR

Lead: Norway



The purpose of the Task Force is to highlight

- ❖ Main differences between offshore and onshore CO₂-EOR
- ❖ Issues that are different between offshore CO₂-EOR and pure offshore CO₂ storage
- ❖ New technical solutions that will benefit both pure offshore CO₂ storage and offshore CO₂-EOR.



Courtesy: AkerSolutions

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.

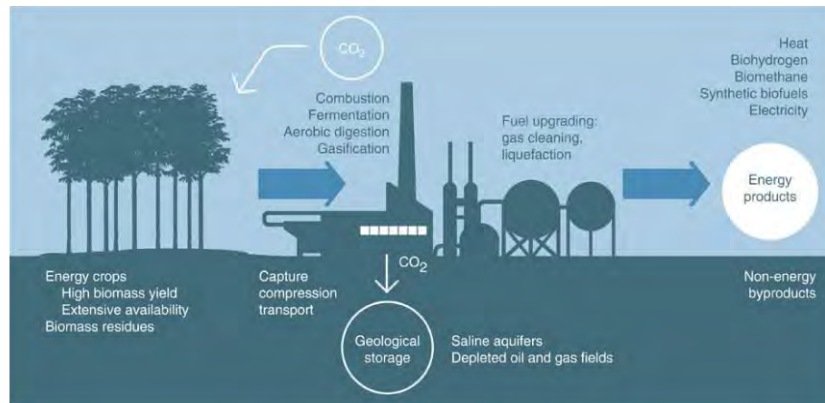


Figure 1: Concept of Bio-CCS (Carnadell & Schultze, 2014)

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.

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

CSLF 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.