



MEETING SUMMARY

WORKING SESSION OF CSLF PROJECTS INTERACTION AND REVIEW TEAM (PIRT)

Canberra, Australia

Offices of Geoscience Australia

01-03 February 2010

(Note: this Meeting Summary was developed with the assistance of Stefan Bachu)

Meeting Participants (CSLF delegates):

- Nick Otter, PIRT Chairman, representing United Kingdom, also CEO of the Global CCS Institute (GCCSI)
- Clinton Foster, Australia
- Stefan Bachu, Canada
- Didier Bonijoly, France
- Harry Schreurs, The Netherlands
- Trygve Riis, Norway, Chairman of the CSLF Technical Group
- Victor Der, United States, Chairman of the CSLF Policy Group
- John Panek, CSLF Secretariat

In addition, the following individuals participated intermittently:

- Aleks Kalinowski, Geoscience Australia
- Rick Causebrook, Geoscience Australia
- Peter Cook, CO2CRC, Australia
- Bill Koppe, GCCSI, Australia
- Colin Whyte, ZeroGen, Australia
- Nils A. Røkke, Norway

1. Open Remarks and Discussions

The meeting was opened by Clinton Foster (Australia) who welcomed the participants and spoke about Australia's commitment to CCS through legislation (Australia Offshore Petroleum and Greenhouse Gas Storage Act), commitment of more than A\$10 million over four years to Geoscience Australia for regional studies, monitoring studies and international collaboration.

Nick Otter, PIRT Chairman, followed with remarks that stressed that:

- this decade will be critical for CCS;
- CSLF will hopefully play a major role in setting strategy for CCS, hence the importance of this PIRT meeting; and
- It was agreed at the CSLF Ministerial-level Meeting in London, October 2009, to review the PIRT Terms of Reference and define future action plans, which is the purpose of the current meeting.

Continuing, the Chair listed the initial PIRT purpose and tasks:

- Encourage and assess candidate projects for inclusion in the CSLF portfolio.
- Facilitate sharing of information and experience to take up CCS.
- Identify critical technology gaps and work towards filling them through collaborative initiatives.
- Encourage countries to develop national CCS roadmaps and work towards their implementation.

The Chair listed PIRT achievements:

- A series of projects have been added to CSLF portfolio (ten at the London CSLF Ministerial-level Meeting).
- Mechanisms and procedures have been put in place for assessing and evaluating candidate projects.
- A Technology Gap review has been produced.
- The CSLF Technical Roadmap has been revised.
- Coordination with the International Energy Agency Greenhouse R&D Programme (IEA GHG) has been established.
- A series of seminars and workshops have been organized and run that supported CSLF activities, particularly for capacity building.

The Chair stated the reasons for change:

- Pace of CCS has accelerated significantly in the last two years.
- There is greater recognition of the role of CCS in mitigating climate change effects.
- There is an increasingly accepted need for a series of large-scale integrated, commercial-size CCS projects (demonstration, first-of-a-kind).
- There are significant developments internationally, such as the creation of the Global CCS Institute, the increasing involvement of the International Energy Agency (IEA) in CCS and the attention given to CCS by the G8.
- There is need for greater and smarter cooperation and collaboration on CCS
- There is need to develop capacity and capability to deliver across a whole range of issues.
- Technical aspects need to be considered in the full CCS context.

The Chair also stated the importance of CCS projects:

- Within the CSLF portfolio for:
 - R&D
 - Technology validation
 - Pilots for demonstration
 - Knowledge sharing
- Supported by GCCSI (with an initial budget of A\$50 million)
 - Large-scale demos
 - Commercial-scale plants
 - Knowledge sharing

In closing, the Chair stated the aims of the PIRT meeting:

- Set the technical direction for the period 2010-2013 (when the CSLF Charter is set to expire unless renewed).
- Ensure consistency with the CSLF Strategic Plan.
- Align CSLF with IEA, IEA GHG, and GCCSI.

The focus should be on the following:

- How to analyze what was done to date
- What are the learnings?
- What additional actions and projects are needed?
- Where there is need for corroboration
- How to bring the necessary resources to bear.

The Chairman of the CSLF Technical Group, Trygve Riis, added that there is need to better define the criteria for CSLF project recognition.

The opening remarks were followed by PIRT discussions among the members present.

- The need for clarification regarding CSLF's future past 2013 was recognized because it will affect decisions in regard to PIRT, various task forces, project recognition, relations with other organizations (e.g., GCCSI, IEA GHG, etc.).
- The Chairman of the CSLF Policy Group, Victor Der, stated the following:
 - CSLF is likely to continue in one form or another because governments are the major CSLF stakeholders, there is need for this type of government-to-government interaction, and there is no other organization to provide this type of mechanism.
 - CSLF is the forum for sharing issues, at least on policy matters, while other organizations are focused only on technical matters.
 - In the carbon trading community there is the belief that the storage component of CCS (not the capture) is an unproven technology, and this technology needs to be proven to gain confidence.
 - Although climate change is a global issue, CCS is a local issue because it affects the local communities living nearby a CCS operation.

- Significant discussion took place around the criteria for CSLF project recognition.
 - The PIRT criteria need tightening up: when a project is considered started: when is announced? when funding is in place? when construction starts? based on size?
 - Not all the CCS projects can be recognized by CSLF (e.g., GCCSI has a database of approx. 300 projects and growing).
 - Projects recognized by CSLF should move knowledge forward; size should not be a criterion for recognition.
 - The issue of recognizing projects based on funding is a difficult one because funding changes during the life of a project, at least in initial stages (in the order of months to years).
 - Projects should demonstrate the storage technology and its safety and security, and should cover the link between “capture-ready” and “storage-ready.”
 - Projects recognized by CSLF should be significant in a certain way.
 - Projects should share knowledge, which so far was achieved with limited success.

2. Presentations

- Nils A. Røkke of Norway made a presentation on Research, Development and Demonstration activities in Clean Coal and CCS supported by the European Union.
- Peter Cook of CO2CRC, Australia, made a presentation about the CO2CRC Otway Project.
- Colin Whyte made a presentation about the ZeroGen Project in Queensland, Australia (IGGC plant with CCS).

3. Comparison of Various Roadmaps

At present there are several CCS roadmaps produced by various bodies with an international mandate: CSLF, IEA, GCCSI, MEF (Major Economies Forum on Energy and Climate Change).

The IEA roadmap is based on a “top-down” approach, starting from the Blue-Map Scenario of what emission reduction targets should be achieved by 2050, and working its way back.

The CSLF roadmap uses a “bottom-up” approach, starting from where we are at present and identifying/defining what needs to be done.

The GCCSI roadmap (Strategic Analysis of the Global Status of CCS, performed by Worley Parsons on behalf of GCCSI) has more granularity/detail, being focused primarily on what projects are in existence, what they do and what they have to do.

The MEF roadmap was prepared for the G8/G20 meetings in Canada this summer and is a menu-type list for each country to choose what best fits her conditions.

The IEA and GCCSI roadmaps are more focused on barriers to deployment, the CSLF roadmap is constrained by its mandate (i.e., focus only on technology, stay out of policy).

Recommendations by the various roadmaps are different, but they are not in conflict with each other.

The CSLF roadmap could address scaling-up technology.

Conclusion: The CSLF Roadmap needs updates on economics (it used the IPCC, 2005, metrics), country activities, project updates and scaling-up.

4. Review of Key Technology Gaps

4.1 Capture

The need in CO₂ capture is to reduce capture costs and efficiency penalties. Identified gaps are:

- alternative absorption solvents or materials that reduce capture costs and increase energy efficiency compared with amine-based systems;
- alternative power generation processes that have the potential to produce improved economics compared with absorption-based capture; and
- improvement of generation efficiency, which will automatically lead to reduced capture costs and penalties.

4.2 Transportation

The need in CO₂ transportation is to optimize transport infrastructure to accept CO₂ from different sources. Also reduce transportation costs. Identified gaps are:

- understanding the effect of impurities on transportation systems (pipeline, compressors,...);
- modeling capability, including compression and optimization, to improve the transportation network linking sources and sinks; and
- response and remediation procedures in case of CO₂ pipeline accidents.

4.3 Storage

The storage component of CCS presents most needs and technological gaps in the areas of demonstrating sufficiency of storage capacity, validation of monitoring for safety, long-term security of storage, and environmental impact and verification. The identified gaps are:

- comprehensive national and global atlases of CO₂ storage capacity in suitable formations, with information on emission sources and other relevant details;
- understanding of CO₂ storage capacity and geomechanical and geochemical properties of deep saline aquifers;
- understanding the effect of impurities in the CO₂ stream on capacity, safety and security of storage;
- site-specific information on CO₂ background concentration;
- development of instruments and methodologies capable of discriminating between CO₂ from natural processes and CO₂ from storage sites;

- site-specific information about seismicity;
- capability of ensuring long-term site security (post-injection), including verified and accepted mathematical and numerical models of storage processes and risk assessment tools;
- best practices guidelines for site selection, characterization, operation and closure, including risk assessment;
- site-specific evaluation of the effect of production on the integrity of oil and gas reservoirs, including the status of abandoned wells; and
- development on a site-specific basis of response and remediation plans prior to injection.

4.4 Additional technology gaps not identified in the current roadmap

Additional technology gaps were identified in the area of CO₂ storage:

- optimization of injection and sustainability of high injection rates;
- proof of concept of other geological media, such as basalts and low-permeability rocks (e.g., organic-rich shales);
- effects of oil and gas field development on the hydrodynamic regime in deep saline aquifers;
- leakage flux rates in natural and anthropogenic systems;
- well-bore integrity, particularly effects of CO₂-rich brine and/or water-saturated CO₂ on cements;
- non-seismic geophysical techniques; and
- effect of multiple large-scale operations on aquifer hydrodynamics and shallow groundwater, including brine displacement.

A final list of technology gaps was compiled (see Addendum).

5. Status of CSLF-recognized Projects

Currently there are nine CSLF-recognized projects that have been completed, eleven previously recognized-projects still in progress, and ten newly-recognized projects at the CSLF Ministerial-level Meeting in London in October 2009.

An attempt was made at the meeting to check these projects against the technology gaps identified in the CSLF Technology Roadmap. It was agreed that the CSLF Secretariat will produce a matrix to check the CSLF-recognized projects against the technology gaps.

6. Engaging CSLF-recognized Projects and Sharing Information

The need for project engagement and information sharing was identified for a number of reasons, including more recognition and raising profile for both the respective projects and for CSLF.

Projects should share their experience, what hurdles they had to overcome and how long it took them to overcome them, lessons learned, etc., so new projects understand the issues and how to solve them.

Projects that receive government funding should be required to share information and should be required to apply for CSLF recognition.

Projects should be asked a series of questions, such as:

- what is needed for the project to succeed besides funding;
- what advantages the project sees in increased interaction between CSLF-recognized projects; and
- what the project would like CSLF to do to enhance interaction between the respective project on other CSLF-recognized projects (e.g., sharing of learnings, specific topic-focused meeting).

It was suggested to have a conference with CSLF projects alternating with the GHGT conferences, which will enhance project interactions. The following should be determined for such a conference.

- Objective;
- Outcome;
- Topics;
- Strategy on where/when/venue; and
- Are there models to follow?

7. Updating the CSLF Technology Roadmap

It was agreed that the CSLF Technology Roadmap needs updating in the following four areas:

- Technology gaps;
- Economics;
- Country updates; and
- Project updates.

Project updates should be provided by July to be ready for the next CSLF meeting assumed to be some time in November.

Norway will lead the Gaps subgroup, with GCCSI and United States support. It was suggested to introduce a Technology Maturity Index to determine whether or not the gap is being closed.

8. Review of PIRT Terms of Reference

The PIRT Terms of Reference was reviewed and revised and will be submitted to the Technical Group at its March 2010 meeting for its approval.

The CSLF Project Submission Form was also reviewed and updated.

9. Change of PIRT Chairmanship

As a result of taking the position of CEO of GCCSI, Nick Otter stepped down as PIRT Chair, and Clinton Foster (Australia) was elected as the new Chair.

10. Action Items

At the end of the meeting a series of action items were identified and broken down into two categories: Immediate and Long-Term.

10.1 Immediate Actions

- Update the CSLF Technology Roadmap with the following schedule:
 - Complete by June 1, 2010, the revision of Technology Gaps section and circulate to PIRT members (Norway and United States).
 - Request, receive and update national programs and projects by July 1, 2010 (Secretariat, country delegations).
 - GCCSI to provide updates of sections 2.1, 2.2 and 2.3 of the Technology Roadmap.
 - Circulate revised Technology Roadmap to PIRT members by July 31, 2010.
 - Table updated Technology Roadmap in October 2010.
 - Present updated Technology Roadmap at the annual CSLF meeting.
- Propose research/review studies for IEA-GHG to undertake (e.g., on basalts and shales as a storage option) and other opportunities (delegates to think of suitable subjects).
- Enhance CSLF visibility using links with other organizations to promote CSLF projects.
- Engage CSLF projects, request updates (Secretariat) and consider organizing a projects workshop to exchange technical information and learnings, address gaps and foster greater interaction (Australia and GCCSI to draft a workshop proposal).
- Develop a plan to attract new projects for CSLF recognition.
- Develop a Gap Matrix by June 2010 (Norway, United States, and GCCSI) and request projects to position themselves within the matrix in order to identify which gaps the projects currently address. The Technology Gap Matrix should be modeled after NASA Technology Readiness Levels.¹
- Develop a project questionnaire to be filled by projects (Secretariat).
- Assess CSLF recognized projects within the Gap Matrix framework.
- Provide a summary of completed projects using the IEA GHG model and post the summary on the CSLF web site.

¹NASA's Technology Readiness Levels are: 1) Laboratory/bench scale; 2) Sub-scale pilot; 3) Full-scale demo; and 4) First-of-a-kind commercial. In addition, Enabling Technologies and Applied Research have to be identified.

- Improve cooperation between various agencies (e.g., IEA, IEA GHG, GCCSI).
- Update PIRT mandate.
- Recommend to the Technical and Policy groups extension of CSLF past 2013 because many of the existing recognized projects will be completed or will end after 2013, and also to attract additional CCS projects for CSLF recognition.

10.2 Long-Term Actions

- Assess progress in closing technology and knowledge gaps by April-May 2011, in preparation for the 2011 CSLF Ministerial-level Meeting that will be hosted by China.
- Engage groups of experts in assessing technical scientific progress.
- Recommend to the Technical Group to form a Task Force for Assessment of Gap Closing, to be chaired by the Technical Group Vice-Chair (Australia). This Task Force should comprise Working Groups on:
 - Capture, with possible members: United States (lead) and UK;
 - Transportation, with possible members: Netherlands (lead) and Australia;
 - Storage, with possible members: Canada (lead), France and United States; and
 - Integration, to be led by GCCSI.
- New members will be asked to join various working groups at the Technical Group Meeting in Pau in March 2010.
- Promote awareness within CSLF of new developments through:
 - project engagement workshops/events;
 - project networks; and
 - collaboration with, or organization of CSLF events in conjunction with key CCS events, such as GHGT conferences.