



MEETING SUMMARY

Projects Interaction and Review Team (PIRT) Meeting
Bergen, Norway
11 June 2012

Prepared by the CSLF Secretariat

LIST OF ATTENDEES

Chairman: Clinton Foster (Australia)

CSLF Delegates

Australia:	Richard Aldous
Brazil:	Paulo Negrais Seabra
Canada:	Stefan Bachu
China:	Ping Zhong
European Commission:	Estathios Peteves, Jeroen Schuppers
France:	Didier Bonijoly, François Kalaydjian
Germany:	Jürgen-Friedrich Hake
Italy:	Sergio Persoglia
Japan:	Ryo Kubo
Korea:	Chang-Keun Yi
Netherlands:	Paul Ramsak
Norway:	Trygve Riis
Poland:	Elżbieta Wróblewska
Saudi Arabia:	Ahmed Aleidan
South Africa:	Tony SurrIDGE
United Kingdom:	Philip Sharman
United States:	Grant Bromhal, Joseph Giove

CSLF Secretariat: John Panek, Richard Lynch

Observers:

China:	Mingyuan Li, Xiaochun Li, Xiuzhang Wu
Germany:	Martin Streibel
Korea:	Chonghun Han
Norway:	Lars Ingolf Eide, Arne Graue, Åse Slagtern
United Kingdom:	Mark Crombie, Vince White
United States:	Chris Babel, Rob Finley, Jeff Jarrett, Scott McDonald

1. Welcome and Summary of Previous PIRT Meeting

PIRT Chairman Clinton Foster of Australia welcomed participants to the 17th meeting of the PIRT and provided a brief summary of the September 2011 PIRT meeting in Beijing, China. The PIRT reached consensus at the Beijing meeting on the following:

- Recommendation that the Rotterdam Opslag en Afvang Demonstratieproject (ROAD), the CGS Europe Project, the SaskPower Integrated Carbon Capture and Storage (CCS) Demonstration Project at Boundary Dam Unit 3, and the CO₂ Capture Project – Phase 3 be approved by the Technical Group;
- Adoption of four official classifications for CSLF-recognized projects: “Completed”, “Active”, “Inactive”, and “Withdrawn by Sponsor”;
- Agreement that country-specific CCS activities now described in Module 2 of the CSLF Technology Roadmap (TRM) will be moved from the Roadmap to a new section of the CSLF website and will be updated annually;
- Agreement that future major revisions to the TRM will be done on a three-year cycle, with the next major revision scheduled for 2013;
- Agreement that future CSLF Technical Workshops are an essential CSLF activity with a desired frequency of at least one per year, and that the PIRT and Technical Group should be opportunistic concerning the scheduling, location, and subjects of interest for these Workshops;
- Agreement that the twelve proposed Actions in the Technical Group Action Plan are to be prioritized in order of importance by CSLF Members; and
- Agreement to postpone any action on revising the CSLF Project Submission Form, including the Gaps Checklist, until this current meeting.

Dr. Foster also thanked Stefan Bachu of Canada for filling in as Chair of the Beijing PIRT meeting.

2. Adoption of Meeting Agenda

The meeting Agenda was adopted with no changes.

3. Introduction of Meeting Attendees

PIRT meeting attendees introduced themselves. In all, sixteen CSLF Members were represented at the meeting.

4. Approval of Meeting Summary from Beijing PIRT Meeting

The Meeting Summary from the September 2011 PIRT meeting in Beijing was approved as final with no changes.

5. Review of Action Items from Beijing Meeting

John Panek of the CSLF Secretariat reported that all four action items from the Beijing meeting have been completed or are in progress. The action item for the Secretariat to migrate country-specific CCS activities from the TRM to the CSLF website should be completed in time for the 2012 CSLF Annual Meeting in October.

6. Report from CSLF Secretariat

John Panek gave a brief presentation that provided an update on project classification, a review of previous CSLF meetings, and an update on upcoming CSLF Events. Following the Beijing PIRT meeting, the Secretariat prepared a summary of the status of all CSLF-

recognized projects according to the new classification criteria. As of June 2012, there are 24 active projects, nine projects that have been completed, five projects that have been withdrawn by sponsor, and one project that is inactive. The Secretariat will add interactive maps to the “Projects” section of the CSLF website for both the active and completed projects.

Mr. Panek stated that in the time following the Beijing meeting there have been three CSLF meetings: the Global CCS Institute (GCCSI)/CSLF Technical Workshop on Project Integration (November 2011 in London), a Carbon Capture, Utilization and Storage (CCUS) Financing Roundtable (January 2012 in Paris), and Capacity Building Workshops (March 2012 in Mexico City). The Project Integration Workshop had about 50 attendees and featured interactive discussions among participants. The message from the workshop was that the first-of-a-kind demonstration projects must focus on making CCS/CCUS work at scale and that real innovation should be left to ‘next-of-a-kind’ demonstrations. Also, there was consensus from workshop participants that more work is needed in the areas of plant heating/cooling in the CO₂ capture process, integration of non-CO₂-capture environmental control systems, and identification and understanding of scale-up risks for the individual technologies in large-scale demonstrations.

Mr. Panek stated that Richard Lynch of the Secretariat would provide a short summary of the CCUS Financing Roundtable at the next day’s full Technical Group meeting. Mr. Panek also stated that the Capacity Building Workshops in Mexico City featured presentations by CSLF delegates Stefan Bachu and José Miguel González-Santaló, and that it was a two-week event with CO₂ storage the focus of the first week and CO₂ capture the second week.

Mr. Panek closed his presentation by mentioning that there were four upcoming CSLF events in the next few months: a Risk and Liability Workshop (July 2012 in Paris), Capacity Building Events in Brazil (August 2012) and China (October 2012), and the CSLF Annual meeting in Perth, Australia (October 24-26, 2012). A Perth meeting page is already online at the CSLF website.

7. Review and Approval of Projects Nominated for CSLF Recognition

The following three projects had been nominated for CSLF recognition:

- Illinois Basin-Decatur Project (nominated by the United States and the United Kingdom)
- Illinois Industrial Carbon Capture and Storage Project (nominated by the United States and France)
- Air Products CO₂ Capture from Hydrogen Facility Project (nominated by the United States, the Netherlands, and the United Kingdom)

Presentations on each of these projects were made by representatives of the project sponsors.

Illinois Basin-Decatur Project

Robert Finley of the Illinois State Geological Survey at the University of Illinois, speaking for the project consortium, provided a presentation about the project. This is a large-scale carbon CCS demonstration project of the Midwest Geological Sequestration Consortium (MGSC), one of the seven Regional Partnerships organized by the United States Department of Energy (DOE). The project is being led by the Illinois State Geological Survey. Up to 1 million metric tons of CO₂ will be injected over a 3-year

period into a Cambrian-age geological formation called the Mt. Simon Sandstone at a rate of 1,000 tonnes per day and a depth of about 2 kilometers. After three years, the injection well will be sealed and the reservoir monitored using geophysical techniques. The CO₂ is being captured from the fermentation process used to produce ethanol at Archer Daniels Midland Company's corn processing complex in Decatur, Illinois, in the United States. The Mt. Simon Sandstone is the thickest and most widespread saline reservoir in the Illinois Basin, with a CO₂ storage capacity estimated from 11 to 151 billion tonnes. Monitoring, verification, and accounting (MVA) efforts began in 2008 and include tracking the CO₂ in the subsurface, monitoring the performance of the reservoir seal, and continuous checking of soil, air, and groundwater both during and after injection. Operational injection of CO₂ began in November 2011.

The goal of this project is to demonstrate the potential of the Mt. Simon Sandstone to be a significant CO₂ geologic sequestration reservoir for the Illinois Basin region in the United States. The key research targets for MGSC's large-scale injection test relate to CO₂ injectivity and volumetric storage capacity of the saline reservoir, the integrity of the seals to contain the CO₂ in the subsurface, and the entire process of pre-injection characterization, injection process monitoring, and post-injection monitoring to understand the fate of the injected CO₂. The focus is on demonstration of CCS project development, operation, and implementation while demonstrating CCS technology and reservoir quality.

After brief discussion, there was consensus to recommend that the project be approved by the Technical Group.

Illinois Industrial Carbon Capture and Storage Project

Scott McDonald, Biofuels Development Director for project sponsor Archer Daniels Midland, gave a presentation about the Illinois Industrial Carbon Capture and Storage Project. This is a large-scale project, also located in Decatur, Illinois, which will collect up to 3,000 tonnes per day of CO₂ from the Archer Daniels Midland ethanol production plant in Decatur and store it in the Mt. Simon sandstone formation. Mr. McDonald noted that the captured CO₂ generated by this industrial process was more than 99% pure, in contrast to the lesser purity of CO₂ streams from power plants. Project scope includes the design, construction, demonstration, and integrated operation of CO₂ compression, dehydration, and injection facilities, and MVA of the stored CO₂. Engineering, permitting, and construction activities are underway and are scheduled to conclude by mid 2013. Operation of the CO₂ capture and storage facility will begin during the second half of 2013.

The goals of this project are to design, construct, and operate a new CO₂ collection, compression, and dehydration facility capable of delivering up to 2,000 tonnes of CO₂ per day to the injection site; to integrate the new facility with an existing 1,000 tonnes of CO₂ per day compression and dehydration facility to achieve a total CO₂ injection capacity of 3,000 tonnes per day (or one million tonnes annually); to implement deep subsurface and near-surface MVA of the stored CO₂; and to develop and conduct an integrated community outreach, training, and education initiative. Unlike the Illinois Basin – Decatur Project, which focuses on research aspects of large-scale CCS, this project is intended to be an industrial commercialization project. A significant feature of the project is its “negative carbon footprint”, meaning that there will be a net reduction of atmospheric CO₂. There is also a possibility that CO₂ from this and other Archer Daniels Midland ethanol facilities could be used in the future for enhanced oil recovery (EOR), as the Illinois Basin is a petroleum producing region.

After brief discussion, there was consensus to recommend that the project be approved by the Technical Group.

Air Products CO₂ Capture from Hydrogen Facility Project

Vince White, Research Associate in Air Products and Chemicals Inc.'s Energy Technology Division, gave a presentation about the Air Products CO₂ Capture from Hydrogen Facility Project. This is a large-scale commercial project that will demonstrate a state-of-the-art system to concentrate CO₂ from two steam methane reformer (SMR) hydrogen production plants, and purify the CO₂ to make it suitable for sequestration by injection into the existing West Hastings Field oil reservoir as part of an ongoing CO₂-EOR project. To accomplish this, Air Products plans to retrofit its two Port Arthur SMRs with two vacuum swing adsorption (VSA) systems to separate the CO₂ from the process gas streams at these facilities so that the CO₂ can be compressed, dried, and delivered by pipeline. Air Products' carbon capture processes would convert the initial gas streams, which contain more than 10% CO₂, to greater than 97% CO₂ purity with negligible impact on the efficiency of hydrogen production. The technology would remove more than 90% of the CO₂ from the process gas stream.

The commercial goal of the project is to recover and purify approx. 1 million tonnes per year of CO₂ for pipeline transport to Texas oilfields for use in EOR. The technical goal is to capture at least 75% of the CO₂ from a treated industrial gas stream that would otherwise be emitted to the atmosphere. A financial goal is to demonstrate real-world CO₂ capture economics.

After brief discussion, there was consensus to recommend that the project be approved by the Technical Group. However, it was noted by several PIRT delegates that more details about this project than had appeared on the Project Submission Form would be useful. Joseph Giove of the United States agreed to work with the project sponsor to revise and enhance the project's Project Submission Form.

8. Update on Technical Group Action Plan

There was agreement to skip this item. John Panek indicated that there would be a presentation by the Secretariat on this topic at the next day's full Technical Group meeting.

9. Update of CSLF Project Submission Form

Clinton Foster reiterated that a consensus from the Beijing PIRT meeting was to postpone any action on revising the CSLF Project Submission Form, including the Gaps Checklist, until this current meeting. At the May 2011 PIRT meeting in Edmonton, there had been agreement that the existing and lengthy Gaps Checklist needed revision as it was not achieving its intended purpose. At the September 2011 PIRT meeting in Beijing, a simplified Checklist developed by Dr. Foster had been put forth for consideration, but there had not been consensus for adoption.

Ensuing discussion examined the question if the current Checklist was doing its job. Dr. Foster mentioned that the current Checklist had been in existence for several years, and that information provided by project sponsors via the Checklist was not being used in the project evaluation process. Philip Sharman of the United Kingdom suggested that more detail is actually needed for certain activities, and an oversimplification of the Gaps Checklist might eliminate a critical source of information. Richard Lynch pointed out that the great amount of granularity and detail in the Checklist had led to projects with

similar scopes providing greatly different information on technology gaps being addressed. Jürgen-Friedrich Hake of Germany thought it would be a good idea to see how the existing slate of active and completed CSLF-recognized projects would compare under a simplified Checklist. Dr. Foster proposed that the Australia delegation do this categorization, with results to be presented at the next PIRT meeting. There was consensus for this approach, and further discussion was tabled until then.

10. Review of Plan for Updating the CSLF Technology Roadmap

Clinton Foster briefly reviewed the history of the TRM. The original version, from 2004, attempted to answer the question, “What does the CSLF Technical Group hope to accomplish by 2013, and how do we get there?” That version of the TRM incorporated the vision and goals of the CSLF while incorporating the roles and responsibilities of the Technical Group. Key obstacles were identified, as well as potential CCS projects for various regions of the world. Since then, the TRM has evolved to focus more on commercial-scale development and less on research and pilot-scale activities. Also, the number of CCS and CCUS projects worldwide had increased so much that over the past decade that there had been agreement at the 2011 meeting in Beijing that these country-specific activities would be migrated from the TRM to the CSLF website. Dr. Foster suggested that one question the PIRT should consider is if the TRM has reached the end of its usefulness in its present form and if it should perhaps be transformed into a Technical Group progress report with a focus on technology issues identified by the various Technical Group task forces. Such an approach could be helpful for any policy-driven decision making by CSLF Ministers.

Ensuing discussion centered on what the next major revision of the TRM should look like. Stefan Bachu agreed that the current TRM format is obsolete and should be changed, but that the TRM should not become a collection of progress reports from task forces as CSLF Ministers would want one concise document. Trygve Riis agreed, and mentioned that a single concise TRM would carry more weight with policy makers than a pieced-together progress report. In the end, there was general agreement that a TRM was preferable to a progress report, and that the content and format should be re-thought. There was also discussion concerning the timeframe to be encompassed by the document. Richard Aldous of Australia suggested that the TRM should provide a CCUS pathway out to the year 2050, as many countries have signed up for 2050 greenhouse gas (GHG) emissions targets. However, several other PIRT delegates thought it would be difficult to develop such a long-term pathway scenarios, given current time and resource constraints. It was eventually decided that the Technical Group was not yet ready to describe possible CCUS pathways beyond 2020, so the next major revision of the TRM would maintain the current timeline.

Concerning the schedule for updating the TRM, Dr. Foster stated that a good goal would be for the next major revision of the TRM would be a deliverable at the 2013 CSLF Ministerial Meeting. John Panek pointed out that more than one year would be needed to accomplish this, and in that context the minor update to the TRM that had been intended for the 2012 CSLF Annual Meeting would divert effort from the 2013 major revision. There was general agreement with Mr. Panek, and it was decided that the PIRT would recommend to the Technical Group that plans be dropped for a 2012 TRM revision. Dr. Foster suggested that the PIRT should recommend to the Technical Group that a TRM Steering Committee / Editorial Board, chaired by the Technical Group Chairman, be established to work out all details concerning the structure and schedule, and to oversee the development of the new TRM. There was consensus for this approach.

11. CSLF Technical Workshops

John Panek reminded meeting attendees that the next Technical Workshop, focused on Capture Technologies, is being held on June 14 as a part of the current overall CSLF Technical Group Meeting. Dr. Foster reiterated that one of the consensuses from the Beijing PIRT meeting was that CSLF Technical Workshops are an essential CSLF activity. The next opportunity after that for a Technical Workshop would be at the 2013 Technical Group Meeting, which Italy is interested in hosting. Ensuing discussion reached the agreement that a good theme for the 2013 Workshop would be Monitoring. Stefan Bachu stated that he would make this suggestion at the following day's full Technical Group Meeting.

12. New Business

There was no new business.

13. Adjourn

Dr. Foster thanked the attendees for their patience and participation and adjourned the meeting.

Summary of Consensus Reached

- The following three projects were approved by the PIRT and were sent forward to the Technical Group for its consideration:
 - Illinois Basin-Decatur Project
 - Illinois Industrial Carbon Capture and Storage Project
 - Air Products CO₂ Capture from Hydrogen Facility Project
- Consideration of the proposed simplified Gaps Checklist was deferred to the next PIRT meeting.
- The PIRT recommends that the Technical Group not proceed with a 2012 minor revision to the TRM.
- The PIRT recommends to the Technical Group that the 2013 TRM timeline extend only to the year 2020.
- The PIRT recommends to the Technical Group that a new Steering Committee / Editorial Board, chaired by the Technical Group Chairman, be formed to oversee and shepherd the process of completing the 2013 TRM.
- The PIRT recommends to the Technical Group that the 2013 Technical Workshop be "Monitoring" themed.

Summary of Action Items

Item	Lead	Action
1	United States	Work with the sponsor of the Air Products CO ₂ Capture from Hydrogen Facility Project to revise and enhance its Project Submission Form.
2	Australia	Categorize active and completed CSLF-recognized projects using the simplified Gaps Checklist.