CARBON SEQUESTRATION LEADERSHIP FORUM

TECHNICAL GROUP

DRAFT

MINUTES OF THE CSLF TECHNICAL GROUP MEETING OF 13 AND 15 SEPTEMBER 2004

Note by the Secretariat

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Note by the Secretariat

Background

A meeting of the Technical Group of the Carbon Sequestration Leadership Forum was held on 13 and 15 September 2004 in Melbourne, Australia, in conjunction with meetings of the CSLF Ministers and Policy Group. Draft minutes of that meeting were compiled by the Secretariat and are being circulated with this Note to the Technical Group delegates for comments.

Action Requested

Technical Group delegates are requested to review and provide comments on these revised draft minutes.

Conclusions

Upon incorporation of comments into a revised Draft minutes, the Technical Group will be requested to note in the minutes of its next meeting that:

> "The Technical Group approved as final the minutes of its September 2004 meeting."

Carbon Sequestration Leadership Forum
Draft Minutes of the Technical Group Meeting
2nd Ministerial Meeting, Melbourne, Australia
13 & 15 September 2004

LIST OF ATTENDEES

Official Delegates

Australia:	John Bradshaw, Peter Cook
Brazil:	Paolo Cunha, Paolo Rocha
Canada:	Bill Reynen (Vice Chair), Graham Campbell
China:	Chao Qingchen, Chen Wenying
European Commission:	Denis O'Brien, Lars Stromberg
France:	Christian Fouillac, Pierre Le Thiez
Germany:	Juergen Hake, Hubert Hoewener
India:	Malti Goel
Italy:	Giuseppe Girardi
Japan:	Makato Akai
Mexico:	Juan Mata Sandoval
Norway:	Tore Andreas Torp (Vice Chair), Jostein Dahl Karlsen
Russia:	Gurgen Olkhovsky, Boris Reutov
South Africa:	Roger Wicks
United Kingdom:	Nicolas Otter, Philip Sharman
United States:	Peter Rozelle (Chair), Howard Herzog

Secretariat

Barbara McKee
Robert Donovan
Robert Gentile
George Lynch
Richard Lynch
Kathy Paulsgrove
Jeffrey Price

SUMMARY OF PROCEEDINGS

Session of 13 September 2004

1. Opening Remarks/Welcome

The Chair of the meeting, Dr. Peter Rozelle, called the meeting to order and introduced Australia's Technical Group delegate, Dr. Peter Cook, who welcomed the delegates to Melbourne. Dr. Rozelle then provided a brief synopsis of Technical Group activities since the January 2004 CSLF meeting in Rome and briefly described the two major items the Technical Group would address in its initial session: approval of the ten projects proposed for CSLF endorsement and approval of the CSLF Technology Roadmap.

2. Introductions

Technical Group delegates present for the session introduced themselves. Sixteen of the 17 CSLF Members were represented at this meeting, including the newest CSLF Member, France. Absent was representation from Colombia.

3. Adoption of Agenda

The Technical Group agenda was adopted without change.

4. Review and Approval of Minutes from Rome Meeting

The Technical Group minutes from the January 2004 CSLF meeting were approved with three changes:

- In Item 8 (Discussion of Database Template), 5th bullet, insert "made available" in front of "by members" so that the text now reads: "The CSLF database will include, in addition to data on CSLF endorsed projects, information from major studies on carbon sequestration made available by members." (This change was proposed by Norway.)
- In Item 8, 6th bullet, change "on CSLF-endorsed projects" to "to the CSLF database" so that the text now reads: "The Technical Group will develop an 'information catalogue' that will provide guidance on the type of information to be contained in reports to the CSLF database." (This change was proposed by Norway.)
- In Item 16 (Structuring the CSLF Technology Roadmap), delete the first sentence and replace with: "At the June 2003 meeting of the CSLF, the Technical Group tasked the Secretariat to develop a database as a first stage in the development of a CSLF Technology Roadmap." (This change was proposed by the United Kingdom.)

5. Presentation of Proposed Projects

Rich Lynch of the CSLF Secretariat delivered a short presentation of what had occurred in the project endorsement process since the January 2004 CSLF meeting in Rome. Thirteen projects had been proposed at the Rome meeting, ten of which were submitted for evaluation. Those ten projects had been judged by an Interim Task Force to have met all of the CSLF Project Recommendation Guidelines. Following that, first the Technical Group and then the Policy Group had reviewed the findings and recommended that all ten projects be endorsed by the CSLF at the Melbourne CSLF meeting. The ten projects are:

- ARC Enhanced Coal-Bed Methane Recovery Project (nominators: Canada, United States, and United Kingdom)
- CANMET Energy Technology Centre (CETC) R&D Oxyfuel Combustion for CO_2 Capture (nominators: Canada and United States)
- CASTOR (nominators: European Commission, France, and Norway)
- CO_2 Capture Project, Phase II (nominators: United Kingdom, Norway, Italy, and United States)
- CO_2 Separation from Pressurized Gas Stream (nominators: Japan and United States)
- CO_2SINK (nominators: European Commission and Germany)
- CO2STORE (nominators: Norway and European Commission)
- Frio Project (nominators: United States and Australia)
- ITC CO_2 Capture with Chemical Solvents (nominators: Canada and United States)
- Weyburn II CO_2 Storage Project (nominators: United States, Canada, and Japan)

6. Discussion of Proposed Projects

Following a discussion led by Vice Chair Bill Reynen, all ten proposed projects were approved by the Technical Group and sent on to the Policy Group, with one change:

- France was added as a nominator for the CASTOR project. (This change was proposed by the European Commission. The list of projects, above, incorporates this change.)

Mr. Reynen also requested that the description of the Weyburn II project be updated to reflect that the first phase of the project (i.e., Weyburn I) is now complete.

7. Presentation of Technology Roadmap

George Lynch of the CSLF Secretariat delivered a short presentation that provided an overview of the contents of the CSLF Technology Roadmap as well as a chronology of activities that had occurred in the Roadmap preparation process since a re-draft of the document was directed by the Technical Group at the January 2004 CSLF meeting in Rome. A framework for the re-draft was provided by the United Kingdom, and this was used as a basis for formulating the five modules of the

Roadmap, which were written by the United Kingdom, the United States, and the CSLF Secretariat. These modules were then integrated into a first draft of the revised Roadmap which was reviewed by the Technical Group. Comments received were used to formulate a second draft which was reviewed in an ad hoc meeting of the Technical Group in Salvador, Brazil. Changes proposed from that meeting resulted in the final draft version of the CSLF Technology Roadmap that was presented for approval at the Melbourne CSLF meeting.

8. Discussion of Technology Roadmap

Vice Chair Tore Andreas Torp delivered a short presentation about what the Roadmap is and what it is not: it is meant to be a basis for common understanding that describes technology stages and gaps, but it is not meant to be a list of priorities or a strategic plan. Following an ensuing discussion led by Dr. Torp, the Roadmap was approved and sent forward by the Technical Group but with the following changes:

- Replace Section 0.1 (Mission Statement) with a new Section 0.1 (Context) that reads:
  "As part of its mission under the CSLF Charter to 'identify promising directions for research', the CSLF Technical Group has produced this initial Technology Roadmap. Recognizing that any roadmap needs to be a living document, this Roadmap will be revised and updated on a regular basis.

  Information concerning the CSLF, its Charter, and the activities of the Technical Group can be found at www.cslforum.org"
  (This change was proposed by the European Commission and the new text was drafted by the United Kingdom.)
- Delete Section 0.2 (The CSLF Technical Group and Its Role) and re-number Section 0.3 (The Purpose of the CSLF Technology Roadmap) as Section 0.2. (This change was proposed by the European Commission.)
- Replace the first sentence of the second paragraph of Section 1.6.2 with two new sentences that read:
  "One illustration of the cost of electricity for the gas and coal-fired plants as a function of fuel costs is shown in Figure 6. There is great variability in such costs due to a number of factors, including country-specific conditions."
  (This change was proposed by Australia, the European Commission, and Italy; the new text was drafted by the United Kingdom.)

It was specifically noted that the CSLF Technology Roadmap should not be considered a static document and this version approved and sent forward by the Technical Group is the first step in an evolving process.

Session of 15 September 2004

9. Review of Technical Group First Day

The Chair of the meeting, Dr. Rozelle, called the meeting to order and began the session with the fifth item on the day's Agenda, Review of Key Technology Gaps. Two of the items originally scheduled for the session, an invited presentation by Dr. Sally Benson of the United States on "Protocols and Associated Costs for Long-Term Monitoring of Geologic Storage Projects" and the Review of Ministerial Decisions, had instead taken place during the immediately preceding Joint Session of the Policy and Technical Groups. The Progress Report on the CSLF Website/Database was canceled due to expected time constraints.

Dr. Rozelle noted that a video about the ten CSLF projects had been shown during the Ministerial session and requested that Technical Group delegates provide to the CSLF Secretariat any film footages, animations, or high-resolution graphics about any of the projects that could be used to improve that video. Dr. Rozelle also noted that the CSLF website contains a section with links to CSLF Member programs and encouraged a strong dialog between Technical Group delegates and the CSLF Secretariat so that as much information as possible can be quickly made available from the CSLF website.

10. Review of Key Technology Gaps

Vice Chair Dr. Torp noted that the discussion of the Technology Roadmap in the previous session of the Technical Group had made it obvious that additional work was necessary to examine key technology gaps. These gaps could be categorized in two ways: capture-related (involving thermodynamics and various other aspects of engineering) and storage-related (involving monitoring, measurement, and verification). To that end, Dr. Torp led a discussion that resulted in consensus that two taskforces be created:

- A taskforce to identify gaps in CO_2 capture and transport will consist of the European Commission (lead), China, Italy, Germany, Norway, and the CSLF Secretariat.
- A taskforce to identify gaps in CO_2 monitoring and verification of storage will consist of Canada (lead), the European Commission, France, Norway, the United Kingdom, and the CSLF Secretariat.

At Dr. Torp's direction, each taskforce was limited to five CSLF Members, though more than five volunteered for each. Nominations of individuals to serve on these taskforces were requested within about a week. Each taskforce was requested to initially produce a discussion paper that would then undergo review and be presented at a full Technical Group meeting.

11. Discussion of New Projects

Several projects were introduced and described, for informational purposes only. None of these could be proposed for CSLF endorsement as there is not yet a permanent procedure in place to make that possible. The projects are:

- China/Canada CO_2 ECBM Project (Qinshui Basin). Phil Murray of Canada's Alberta Research Council (ARC) made a short presentation about this project. The project partners are consortiums under the auspices of the Canadian International Development Agency (CIDA) and the Chinese Ministry of Commerce (CMOC), which will each provide Can$5 million in funding. The CIDA consortium has seven different entities, including ARC, while the CMOC consortium includes the China United Coal-Bed Methane Corp., Ltd. This is a pilot-scale project, begun in 2002, which will evaluate reservoir properties of selected coal seams of the Qinshui Basin of eastern China and carry out field testing at relatively low CO_2 injection rates. The goal is to evaluate the process, in terms of methane production and CO_2 storage, with an eye toward potential commercial applications.
- Enhanced Capture of CO_2 (ENCAP) project. Prof. Lars Stromberg of the European Commission made a short presentation about this project. The European Commission has assembled a consortium of 28 members for this project, including power companies, manufacturers, energy and technical gas production companies, engineering companies, research institutes, and universities; industry is expected to provide the majority of the estimated €30 million in overall project funding, with the EC covering the rest. This is a pilot-scale project, begun in 2004, that will develop new pre-combustion CO_2 capture technologies and processes for power generation. The goal is to meet a target of at least a 90% CO_2 capture rate with a cost reduction of at least 50% compared to present technologies.
- SEPCA project. Giuseppi Girardi of Italy made a short presentation about this project. Italy has assembled a consortium of engineering companies, universities, and energy companies for this project under the auspices of the Italian Ministry of Productive Activities and the Italian Ministry of University Instruction and Research. The two Ministries and the consortium partners will likely share the €18 million cost for the initial stages of the project. This is a small-scale project that is intended to develop and evaluate different advanced technologies and processes that can be used in high-efficiency and low-emission power plants of the future. The goal is to implement a small pilot plant (about 1 megawatt) based on coal gasification that includes test rigs for evaluation of these technologies and processes.
- CO_2STOIT project. Giuseppi Girardi of Italy also made a short presentation about this project. This actually consists of three different projects: CONFIGEOLIT, which has a goal of identifying possible CO_2 storage sites in Italy and characterizing their storage capacities; SIBILLA, which has a goal of achieving enhanced oil recovery of 10 million barrels of crude oil over a ten year period while sequestering about 1.5 million metric tons of CO_2 from an existing gasification unit; and PROMECAS, which has a goal of determining

the feasibility for enhanced coal-bed methane recovery with CO_2 sequestration from a deep coal seam on the island of Sardinia. Italy has assembled consortiums consisting of corporate and academic partners for each of these projects with funding coming from its Ministry of Environment, Ministry of Productive Activities, and Ministry of University Instruction and Research.

- Enhanced Oil Recovery using CO_2 from the Carmito Gas Field. Dr. Juan Mata Sandoval of Mexico made a short presentation about this project. For the past several years, Pemex of Mexico has been extracting CO_2 from CO_2-rich natural gas produced from its Carmito gas field and has reinjected that CO_2 to repressurize the field so that additional natural gas can be produced. For economic reasons, the extracted CO_2 can no longer be reinjected into the gas field but it can be used for enhanced oil recovery at an adjacent oil field. The goal of this large-scale project is to demonstrate the commercial viability of the concept while also sequestering about 850,000 metric tons of CO_2 per year over a ten year period.
- In Salah Joint Industry Project on CO_2 Storage Assurance. Philip Sharman of the United Kingdom made a short presentation about this project, which is jointly sponsored by the United Kingdom and Norway. A joint venture presently exists between British Petroleum, Statoil of Norway, and Sonatrach of Algeria for natural gas production from the In Salah gas field of central Algeria. The gas produced is rich in CO_2 so the CO_2 is separated and reinjected into the water leg of the field. One of the components of the In Salah project is a Joint Industry Project on CO_2 Storage Assurance, which has an estimated cost of about $30 million over five years. The goal of this large-scale project is to verify that long-term assurance of geologic storage can be met by short-term monitoring and to demonstrate to stakeholders that such projects represent a viable greenhouse gas mitigation option.

12. Technical Group Future Work Plan

Vice Chair Bill Reynen delivered a short presentation on proposed new activities for the Technical Group. These consist of three main areas:

- Need for a mechanism (with timetable and criteria) for receipt of new project proposals.
- Need for a mechanism for updating the CSLF Technology Roadmap.
- Need for development of standards for storage capacity estimates.

Mr. Reynen then led a discussion, with a supporting presentation by Dr. John Bradshaw of Australia, which resulted in consensus that an additional taskforce be created:

- A taskforce for review and development of standards with regards to storage capacity measurement will consist of Australia (lead), Canada, the European Commission, France, India, Norway, the United States, and the CSLF Secretariat.

Concerning the other two areas, Dr. Denis O'Brien of the European Commission made a short presentation that proposed creation of a new Project Initiation and Review Panel (PIRP) that would report to the Technical Group. The function of the proposed PIRP would be to assess projects proposed for recognition by the CSLF and review the CSLF project portfolio to identify synergies and gaps that would then act as inputs for any future revisions to the Technology Roadmap. Ensuing discussion did not lead to consensus to move forward on this, due in part to possible overlap of the PIRP with Policy Group functions. It was agreed that Dr. O'Brien should develop the PIRP concept further, taking into account the views expressed by the members in discussion, and that Dr. Rozelle (as chair of the Technical group) should ensure that the developed approach should be consistent with the aims of the CSLF in how it relates to the Policy Group. The objective is to re-introduce the issue at the next full meeting of the Technical group.

Finally, Mr. Reynen suggested that the Technical Group review the minutes of its initial June 2003 meeting at Tyson's Corner to ensure that its original work mandate is being met. Consensus was reached to do this.

APPENDIX A
Technical Group Action Items Arising from Melbourne CSLF Meeting

Item	Action	Lead	Due Date
1	Make corrections to Minutes of Jan. 2004 Tech. Group meeting (CSLF-T-2004-11).	Secretariat	completed
2	Make corrections to Summaries of Projects Nominated for CSLF Recognition (CSLF-T-2004-13).	Secretariat	completed
3	Make corrections to CSLF Technology Roadmap (CSLF-T-2004-10).	Secretariat	completed
4	Provide Secretariat with film footages, animations, or high-resolution graphics about any of the nominated projects.	all Technical Group delegates	immediately
5	Re-edit CSLF Projects DVD and Brochure.	Secretariat	end of 2004
6	Provide Secretariat with website links to CSLF Member programs and activities.	all Technical Group delegates	immediately
7	Provide Secretariat with names of delegates to serve on Taskforce for identifying gaps in CO_2 capture and transport.	EC (lead), China, Italy, Germany, Norway	immediately
8	Draft a discussion paper on gaps in CO_2 capture and transport.	Taskforce on CO_2 Capture & Trans.	early 2005
9	Provide Secretariat with names of delegates to serve on Taskforce for identifying gaps in CO_2 monitoring and verification of storage.	Canada (lead), EC, France, Norway, UK	immediately
10	Draft a discussion paper on gaps in CO_2 monitoring and verification of storage.	Taskforce on CO_2 Monitoring & Verif. of Storage	early 2005
11	Provide Secretariat with names of delegates to serve on Taskforce for reviewing and identifying standards with regards to storage capacity measurement.	Australia (lead), Canada, EC, France, India, Norway, USA	immediately
12	Draft a discussion paper on review and identification of standards with regards to storage capacity measurement.	Taskforce on CO_2 Storage Capacity Measurement	early 2005
13	Develop the Project Initiation and Review Panel (PIRP) concept for presentation to full Technical Group.	EC (lead) and USA	mid 2005
14	Review Minutes of June 2003 Technical Group meeting to ensure that Technical Group's original work mandate is being met.	all Technical Group delegates	end of 2004

APPENDIX B
Report from Stakeholder Technical Perspectives Workshop

Dr. Peter Cook of Australia presented a summary of the Stakeholder Technical Perspective Workshop to a Joint Session of the Policy and Technical Groups. Key messages from the Workshop were:

- World capacity for geologic storage of CO_2 is both large and widespread.
- Saline aquifers appear to provide by far the largest overall storage capacity, with depleted oil and gas fields, as well as usage of CO_2 for enhanced coal-bed methane production useful in places.
- There is good experience available for all types of storage reservoirs, though more is needed for both deep saline aquifers and deep unmineable coal seams.
- Cost and public acceptance are key issues. In particular, there is no single number for cost and it will vary greatly depending on geographic region.
- Endorsement is needed from a broad range of stakeholders. Open and transparent communication, especially at the project-specific level, is therefore very important. The public should be educated about various greenhouse gas mitigation options and be allowed to be fully involved in informed debate.
- Comprehensive monitoring and verification is a key component in developing stakeholder confidence in the sustainability of CO_2 capture and storage.
- CO_2 capture and storage should not be looked on as a competitor to energy from renewables or energy efficiency in any portfolio of CO_2 mitigation responses. We need them all.
- Commercialization of CO_2 capture and storage requires stronger market signals. Emissions trading is one method of sending a market signal.
- CO_2 capture and storage technologies, when mature, will help to reduce the financial risk associated with long-term energy-intensive projects in a future carbon-constrained world.
- We have to cross disciplinary and institutional boundaries in order to take CO_2 capture and storage forward. Involvement of developing countries is also critical, as is technology transfer.
- Time is of the essence! We cannot afford to wait 10 or 20 years to obtain needed information. Therefore, more demonstration projects are needed now and these projects should not be unreasonably burdened by regulatory or liability issues.