



# Strategic Plan Implementation Report

January 2009

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**Strategic Plan Committee**  
*CSLF Task Force Strategic Implementation Report (TFIR)*  
December 2008

<b>1. Committee Members</b>
<ul style="list-style-type: none"><li>▪ Canada – Ian Hayhow (Chair)</li><li>▪ Australia – John Hartwell; Bill Koppe</li><li>▪ European Commission – Wiktor Raldow</li><li>▪ France – Bernard Frois</li><li>▪ India – Anil Razdan</li><li>▪ Mexico – José Miguel González Santaló</li><li>▪ Netherlands – Hans Bolscher</li><li>▪ Norway – Tone Skogen; Trygve Riis</li><li>▪ South Africa – Elizabeth Marabwa</li><li>▪ United Kingdom – Rachel Crisp; Milton Catelin; Jeff Chapman</li><li>▪ United States – Justin Swift</li><li>▪ CSLF Secretariat – Barbara McKee</li></ul>
<b>2. Purpose of Committee</b>
<p>Develop a revised and updated CSLF Strategic Plan that will contain:</p> <ul style="list-style-type: none"><li>▪ Significant achievements as strategic destinations,</li><li>▪ Strategies to reach those destinations,</li><li>▪ Activities to execute the strategies,</li><li>▪ Priorities for each of the activities, and</li><li>▪ Milestones to measure progress.</li></ul> <p>As part of the process, the Committee will consider the role and engagement of the CSLF and how it would achieve its long term goal over the next five years.</p>
<b>3. Milestones</b>
<ul style="list-style-type: none"><li>▪ Strategic Plan Committee created at CSLF Cape Town meeting, April 2008</li><li>▪ Draft documents: February 2009</li><li>▪ Approval by Policy Group: June 2009</li><li>▪ Finalized CSLF Strategic Plan will be a deliverable at CSLF Ministerial Meeting in October 2009</li></ul>
<b>4. Status</b>
<ul style="list-style-type: none"><li>▪ The Committee is finalizing its approach for performing the Strategic Plan update. Areas of significant effort will include incorporation of the recommendations to the G8 on near-term opportunities for CCS and updating the previous Strategic Plan taking into account CCS developments outside the CSLF.</li><li>▪ Discussion paper drafted by the Secretariat</li><li>▪ Conference call was held with committee members to set priorities for the plan based on the discussion paper, draft papers due February 2009</li></ul>

**Capacity Building in Emerging Economies Task Force**  
*CSLF Task Force Strategic Implementation Report (TFIR)*  
December 2008

**1. Task Force Members**

- Australia – John Hartwell; Martin Squire; Clinton Foster
- Canada – Ian Hayhow; Bill Reynen; Stefan Bachu
- Colombia – TBD
- European Commission – Jeroen Schuppers
- France – Christian Fouillac; Pierre Le Thiez; Claudia Vivalda
- India – Ishraq Ahmad; Laxman Prasad
- Italy – Pierpaolo Garibaldi
- Mexico – José Miguel González Santaló
- Saudi Arabia – Khalid Abuleif; Abdulmuhsen Al-Sunaid
- South Africa – Elizabeth Marabwa
- United Kingdom – Rachel Crisp; Nick Otter
- United States – Justin Swift (Chair); George Guthrie

**2. Purpose of Task Force**

The objectives of the Task Force (TF) are to assist emerging economy CSLF Members to develop the knowledge, skills, expertise and institutions needed to deploy carbon capture and storage (CCS) technologies, develop training and educational resources that all CSLF Members can utilize, build on lessons learned from CSLF-recognized projects, and collaborate with other international CCS initiatives.

**3. Milestones**

- The Task Force held its 5<sup>th</sup> Workshop on September 9-12, 2008, in Salvador/BA, Brazil, at the 2<sup>nd</sup> Petrobras International Seminar on CO<sub>2</sub> Capture and Geological Storage. A total of 110 attendees from 11 countries participated in the Task Force for Capacity Building workshop, which featured 12 presentations. CSLF experts from around the world shared information with attendees from across Brazil's energy sector in the Petrobras seminar in 24 sessions on topics that spanned (1) capture; (2) compression; (3) transportation; (4) utilization in the oil and gas industries; (5) storage; (6) measurement, monitoring, and validation; (7) CCS policy, management, regulation, education, and public perception; (8) pilot and demonstration projects; (9) CCS sustainability and ethics; and (10) and risk analysis. Petrobras provided special sessions within their seminar for the International Energy Agency, the Society for Petroleum Engineers, the International Petroleum Industry Environmental Conservation Association, and the Brazilian Climate Change and Carbon Sequestration Network, and a special session wherein six invited papers were presented by CSLF Members.
- The overall depth, breadth, and comprehensiveness of the Petrobras event, coupled with its providing a forum for other organizations engaged in CCS activities, offers testament to the soundness of the Task Force's approach to co-convene its capacity building events with those of other organizations around the world that are also engaged in CCS activities. This serves to broaden the delivery of CCS technology, policy, and regulatory information and maximize the impact of this information through the building of new networks of CCS practitioners and those moving toward CCS activities.
- The Task Force held its 6<sup>th</sup> Workshop on November 16-20, 2008, alongside the 9<sup>th</sup> International Conference on Greenhouse Gas Control Technologies (GHGT-9). This workshop drew 40 attendees from 6 countries. The GHGT-9 Conference was organized

by the Massachusetts Institute of Technology, in collaboration with the IEA Greenhouse Gas R&D Programme, with lead sponsorship from the U.S. Department of Energy. This conference drew 1,469 attendees (152 of them students) from 42 countries, and featured 80 presentations.

- The Task Force Chair delivered Welcoming Remarks at the CSLF Technical Group Business Meeting, on November 16, 2008, in Washington, DC.
- The Task Force Chair participated in the CSLF Financial Issues Task Force Meeting, on December 2-3, 2008, in New Delhi, India, and delivered a presentation on U.S. Perspectives on Financing CCS in Emerging Economy Countries.

#### **4. Status**

- Task Force workshops have evolved and been tailored to meet the needs and inputs from participants. Each workshop has built on the successes and lessons-learned from previous workshops, helping to create a solid CCS knowledge foundation that will carry into the future.
- The Task Force continues to explore creation of standardized, core training modules for capacity building based on materials from the initial workshops. These materials would be aimed at both public and private sector decision-makers.
- The following workshops have been proposed:
  - China, 2<sup>nd</sup> quarter 2009
  - Colombia, 2<sup>nd</sup> half 2009
  - India, date TBD
  - South Africa, date TBD
- Financial support for these workshops continues to be an issue of concern and Task Force members will continue to identify new options and co-convening opportunities.

***Project Interaction and Review Team (PIRT)***  
***CSLF Task Force Strategic Implementation Report (TFIR)***  
***December 2008***

**1. Task Force Members**

The Team consists of:

- A Core Group comprising the Chair and Vice Chairs of the Technical Group, and other delegates as designated by the Technical Group. Current membership consists of representatives from:

Australia	Clinton Foster
Canada	Bill Reynen
Denmark	Flemming Ole Rasmussen
European Commission	Jeroen Schuppers
France	Pierre Le Thiez
Germany	Jürgen-Friedrich Hake
India	Ishraq Ahmad
Netherlands	Harry Scheurs
Norway	Trygve Riis
Saudi Arabia	Khalid Abuleif
UK	Nick Otter (Chair)
USA	George Guthrie

The chair is performed via a 3 co-lead approach (currently with Australia, E.C., and UK) with 1 person to change on an annual basis, so ensuring continuity, sharing the work load and providing opportunity for change. During the period of this report the chair resides with the UK.

- A Floating Group comprising representatives of CSLF recognized projects with overall management responsibility in the project (e.g. project manager), as well as other subject area experts.

**2. Purpose of Task Force**

The PIRT has the following tasks:

- Assess projects proposed for recognition by the CSLF in accordance with the project selection criteria approved by the Policy Group. Based on this assessment, make recommendations to the Technical Group on whether a project should be accepted for recognition by the CSLF.
- Review the CSLF project portfolio and identify synergies, complementarities and gaps, providing feedback to the Technical Group and input for further revisions of the CSLF roadmap.
- Identify technology gaps where further RD&D would be required.
- Foster enhanced international collaboration for CSLF projects, both within individual projects (e.g. expanding partnership to entities from other CSLF Members) and between different projects addressing similar issues.
- Promote awareness within the CSLF of new developments in CO<sub>2</sub> Capture and Storage by establishing and implementing a framework for periodically reporting to the Technical Group on the progress within CSLF projects and beyond.
- Organize periodic activities to facilitate the fulfillment of the above functions and to give an opportunity to individuals involved in CSLF recognized projects and other relevant individuals invited by the CSLF, to exchange experience and views on issues of common interest and provide feedback to the CSLF.

- Perform other such tasks that may be assigned to it by the CSLF Technical Group.

### 3. Milestones

Near-term milestones are:

- Assessment of potential candidate CSLF Projects and make recommendations to the Technical Group as to their suitability. (April 2009)
- Identification of areas that are thought to be appropriate for new projects and to encourage the submission of projects in these areas (April 2009)
- Production of updated version of CSLF Technology Roadmap ready for 2009 Ministerial Meeting. (June 2009)
- CSLF Secretariat is continuing to engage with Member countries to obtain links to current Technology Road Maps for each country, and/or strategic planning documents for CCS that they have generated. This item is in response to the PIRT Action Plan item to have a “technical roadmap developed for each area including links with member country roadmaps”. (Ongoing)

### 4. Status

- A mechanism for formalizing a relationship between the PIRT and the IEA GHG has been established and agreed formally by the IEA GHG R&D Programme at the ExCo held in Daejeon, South Korea in October 2007 and by the CSLF Technical Group in Saudi Arabia in January 2008. The ‘pilot’ topic on CO<sub>2</sub> storage capacity coefficients is proceeding and will be considered by PIRT members as part of the formal review process of the IEA GHG. The next IEA GHG ExCo is scheduled for April 2009 in Brisbane.
- Knowledge gained from the EC Zero Emission Platform (ZEP) project is being considered for any relevant PIRT activities. Part of this is to seek to use resources from the EC FP7 R&D Programme in the future, this being open to organizations from CSLF members especially developing countries. An EC call for FP7 will be issued in 2009. The aim is to encourage organizations from CSLF countries to respond together with those from within the EC.
- A plan to review and update the CSLF TRM has been established under the leadership of the EC. This is now being led by the UK and the status was reviewed at meetings in Washington in November 2008. A draft will be considered at the next Technical Group meeting planned for April 2009 in Oslo.
- The comprehensive Gap Assessment completed and presented at the CSLF Workshop in Paris in April 2007 is being used in the current process reviewing and updating the TRM. This is being used to help identify where CSLF projects to could be encouraged in relation to the CSLF Charter. Also continuing to be addressed are the benefits of being a CSLF project and how to engage better with stakeholders. To this end a continuation of the survey conducted by the Secretariat has been initiated for those CSLF projects that did not respond to the initial request and this was reviewed at the meetings in Washington in November 2008.

**Report of CSLF Secretariat**  
*CSLF Strategic Implementation Reporting System (SPIR)*  
December 2008

**A. Meetings and Workshops**

- Past
  - CSLF Technical Group and PIRT meetings (16 November 2008, Washington, D.C., United States). The Secretariat, in coordination with the PIRT and Technical Group Chairs, organized meetings of both the PIRT and the Technical Group, including development of agendas, arrangement of meeting venues, confirmation of invited speakers, and preparation of briefing books for meeting attendees. Following these meetings, the Secretariat developed draft sets of minutes for both meetings and, once approved by the delegates, will post them at the CSLF website. All presentations from the meetings have been posted to the CSLF website (see below).
  - CSLF Capacity Building Workshop (17-20 November 2008, Washington, D.C., United States). The Secretariat planned this workshop around the 9<sup>th</sup> Annual Greenhouse Gas Technologies Conference (GHGT-9), incorporating more than 50 presentations from the conference into the Workshop. Presentations from the Workshop are now online at the CSLF website (see below).
  - CSLF Financial Issues Task Force meeting (2-3 December 2008, New Delhi, India). The Secretariat and the host country, India, planned and organized this workshop. The Secretariat has developed draft minutes of the meeting which, once approved by task force members, will be posted to the CSLF website. Presentations from the meeting are now online at the CSLF website (see below).
- Future
  - CSLF Technical Group meeting (1-2 April 2009, Oslo, Norway). The Secretariat is planning and coordinating the meeting with the Technical Group Chair, including development of the agenda. A meeting information page is now online at the CSLF website (see below). The Secretariat will facilitate any task force meetings scheduled in conjunction with the meeting. All presentations from the meeting and the minutes will also be posted to the CSLF website.
  - CSLF PIRT meeting (31 March 2009, Oslo, Norway). A PIRT meeting may be held at the end of February 2009 at a venue and date to be determined.
  - CSLF PIRT meeting (31 March 2009, Oslo, Norway). A PIRT meeting will be held in conjunction with and just prior to the Technical Group meeting. The Secretariat will work with the PIRT and Technical Group Chairs to develop an agenda for the meeting. All presentations from the meeting will also be posted to the CSLF website.
  - CSLF Policy Group meeting (date and venue TBD). The Secretariat has initiated planning for the meeting.
  - Ministerial meeting of the CSLF (October 12-14, 2009, London, United Kingdom). The Secretariat is involved in the planning and coordination of the Ministerial Steering Group, which is organizing and planning the meeting. The meeting date has been changed to 12-14 October. The CSLF Ministerial will immediately precede the IEA Ministerial meeting. A planning meeting of the Steering Group will take place 26-27 January in London, which will include a tour of the meeting venue.

## **B. Updates to CSLF website (<http://www.cslforum.org>)**

The following updates to the CSLF website have been accomplished since the last reporting period:

- Presentations from the Technical Group business meeting, 16 November 2008, have been added to the “Presentations” section: <http://www.cslforum.org/presentations.htm>
- Presentations from the PIRT meeting, 16 November 2008, have been added to the “Task Forces” section: <http://www.cslforum.org/taskforces.htm>
- Presentations from the 6<sup>th</sup> CSLF Capacity Building in Emerging Economies Workshop, held in Washington, D.C. on 16-20 November 2008, have been added to the “Workshops” section: <http://www.cslforum.org/workshops.htm>
- The October 2008 Plan Implementation Report (SPIR) is online in the “Documents” section: <http://www.cslforum.org/documents.htm>
- The next Technical Group business meeting, 1-2 April 2009 in Oslo, Norway, has been added to the “Events” section: <http://www.cslforum.org/events.htm>
- A new page has been added for the upcoming Oslo meeting of the Technical Group: <http://www.cslforum.org/apr012009.htm>
- Listings of Policy and Technical Group delegates have been updated. These are viewable at the London Ministerial meeting page: <http://www.cslforum.org/oct122009.htm>

## **C. Other Activities**

Over this reporting period, the Secretariat handled approximately 330 pieces of incoming e-mail correspondence.

## **D. Stakeholders**

There are now 154 registered stakeholders, seven of whom have requested not to be shown in the CSLF website listing. Members are encouraged to have their stakeholders register.

**Report from Stakeholders**  
*CSLF Strategic Implementation Reporting System (SPIR)*  
December 2008

**South Africa National Energy Research Institute (SANERI)**

- Creating a Centre for Carbon Capture and Storage in SANERI
- Negotiating a Charter with prospective funders
- Carbon Geological Storage Atlas commenced Sept. 2008 and scheduled to be published April 2010 – with industry [PetroSA, AngloCoal, Eskom, Sasol, and SANERI] financial support
- Centre – once established – planning for an injection test experiment

\* \* \* \* \*

**Anglocoal**

**Monash Energy Update**

The tasks originally assigned for the first stage, the Concept Assessment Phase, have now effectively been completed. In supporting this work the parent companies, Shell and Anglo American, have spent considerable sums to date to investigate the viability of large-scale Coal-to-Liquids (CTL) plant in the Latrobe Valley with related carbon capture and storage (CCS) activities.

Work done to date confirms that no fundamental technical issues or in respect of coal to liquids or carbon capture and storage. The lignite of Victoria can be gasified, and there are attractive markets available for the clean fuel products. The conclusion is that, in the long term, CTL may provide an opportunity for Victoria to provide domestically produced clean liquid fuels for Australian and international markets.

However, at this stage, critical requirements for CTL are not yet in place. The project is not attractive under currently foreseeable economic conditions, due mainly to higher capital cost estimates and escalating construction costs. Other variables include the volatility in the oil price (caused by the global financial crisis) and the present uncertainty about the final form of the emissions trading scheme. Therefore, the Monash Energy project will not, at this time, move towards detailed engineering of a large-scale CTL plant.

The development of the project is moving to a new “Extended Concept Assessment” phase. A smaller, focussed project team in collaboration with the owners and their technical advisers will continue the work required to improve the attractiveness of the project. Focus areas going forward include project economics, technology, CCS and the requirements for coal quality.

\* \* \* \* \*

## **Carbosulcis**

Carbosulcis, Italian coal mining company, is carrying out its Project in the Sulcis Coal Basin, SW Sardinia, Italy, for Enhanced Coal Bed Methane and CO<sub>2</sub> Storage purposes. The Project is funded by the coal company and includes European research institutes (TNO, IFP, BRGM, OGS, URS, Geotec). After the seismic campaign last summer it has started a drilling campaign in order to qualify and characterize the deep coal beds and the aquifer under the coal formation. At least four wells are foreseen within the next two years, and as soon as the deep coal beds are reached, the lab test will start.

The initiative is involved in the Italian research activities for CCS applications, and it aims at being officially a national funded deployment project.

\* \* \* \* \*

## **The Carbon Capture & Storage Association (CCSA)**

CCSA has been extremely active in the last few months.

Main activities have included responding to the UK CCS Consultation and feeding into the EU negotiations on the CCS Directive and the EU ETS Directive, which have now been agreed at the EU Parliament Vote on the 17th December. Our major issues with the CCS Directive included:

- Proposed 50 year post-closure handover period (The final text states a period of 20 years unless the National Authority feels the criteria for handover have been met earlier)
- Proposed minimum 95% purity threshold for CO<sub>2</sub> streams for injection (this has now reverted back to the OSPAR wording of “overwhelmingly CO<sub>2</sub>”)
- The exclusion of EOR in the Directive (this has now been included for the purposes of CO<sub>2</sub> storage)

Included in the ETS Directive was a provision to set aside 300m EU allowances to support CCS projects which could be worth €9 billion. It will be important to influence the allocation of this in the New Year

The CCSA has also focused on issues relating to health and safety, monitoring and reporting guidelines and communications, as well as involvement in a number of relevant conferences. Although the CCSA did not attend the COP meeting in Poznań, a colleague from the IEA GHG who did attend, kindly reported back. The CCSA continues to enjoy a healthy growth in membership, and has become a respected organisation within the international energy community.

*Alberta Enhanced Coalbed Methane Recovery Project*  
*CSLF Project Status Report (PSR)*  
*December 2008*

<b>1. Project Location</b>
Alberta, Canada
<b>2. Project Lead</b>
Brent Lakeman, Alberta Research Council <ul style="list-style-type: none"><li>▪ Telephone: 1 780 450-5274</li><li>▪ E-Mail: <a href="mailto:lakeman@arc.ab.ca">lakeman@arc.ab.ca</a></li></ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"><li>▪ Reduce greenhouse gas emissions by subsurface injection of CO<sub>2</sub> into deep coal beds</li><li>▪ Enhance coal-bed methane recovery factors and production rates as a result of CO<sub>2</sub> injection</li></ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>▪ Completion of a single-well micro-pilot test at Suncor's CSEMP site</li><li>▪ Baseline seismic survey completed</li><li>▪ N<sub>2</sub> tracer injected with offset well monitoring completed</li><li>▪ Long term CO<sub>2</sub> injection initiated and suspended due to well-bore issue</li><li>▪ Alberta and China activities have led to a signing ceremony in China for another CO<sub>2</sub>-ECBM project in the Qinshui Basin</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>▪ CO<sub>2</sub> testing completed for single well micro-pilot</li><li>▪ Engineering and Reservoir Modeling analysis being completed for micro-pilot</li><li>▪ Tilt-meter response being reviewed</li><li>▪ Analysis of injection well issue completed</li><li>▪ Regulatory approval obtained for remedial work on injection well</li><li>▪ Suncor lead consortium discussing termination of CSEMP project</li><li>▪ Final Report expected in early 2009</li></ul>

*CO<sub>2</sub> Capture Project Phase 2 (CCP2)*  
*CSLF Project Status Report (PSR)*  
*December 2008*

<b>1. Project Location</b>
Project Office: 150 West Warrenville Road, Naperville, IL USA 60563
<b>2. Project Lead</b>
<ul style="list-style-type: none"><li>▪ CCP2 Program Manager: Linda Curran, BP</li><li>▪ CCP2 Executive Board Chairman: Gardiner Hill, BP</li><li>▪ Capture Team Lead: Ivano Miracca, ENI</li><li>▪ Storage Team Lead: Scott Imbus, ChevronTexaco</li><li>▪ Communications Team Lead: Iain Wright, BP</li><li>▪ Policy Team Lead: Arthur Lee, ChevronTexaco</li><li>▪ CCP2 Advisory Board Chair: Vello Kuuskraa</li></ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"><li>▪ Develop technology that will reduce costs and improve efficiencies of CO<sub>2</sub> Capture through advanced technologies</li><li>▪ Increase knowledge and reduce uncertainties in technology performance and deliver low-cost CO<sub>2</sub> capture technologies to demonstration stage by 2009</li><li>▪ Demonstrate that geological storage of CO<sub>2</sub> is secure and can represent a viable Greenhouse Gas mitigation technique. Develop technology to address critical issues such as storage site/project certification, well integrity and monitoring</li><li>▪ Increase public awareness and acceptance of CCS</li><li>▪ A distinctive aspect of CCP2 is the emphasis on collaboration and partnership with governments, industry, NGO's and other stakeholders. The members of the partnership recognize the challenges associated with global climate change require solutions that are economically and socially accepted to all.</li></ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>▪ Capture technologies are undergoing rigorous technical and economic assessments prior to development and scaleup in Phase 3 -beginning January 2009.</li><li>▪ Certification Framework: Development continues for a stream-lined, integrated, risk-based model for technical assessment of potential storage sites, including operational parameters, monitoring systems, and success criteria for demonstrating long-term containment.</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>▪ A rigorous process is underway to evaluate the most promising capture technologies for potential pilot or demonstration</li><li>▪ Information from 3 well evaluations has been assessed to determine the long-term sealing capacity of wells in a CO<sub>2</sub>-rich environment, type and levels of risk posed by failure of well components, and preventative and remediative engineering solutions.</li><li>▪ Novel approaches to optimize the resolution and cost effectiveness of monitoring, leakage detection and verification are under development</li><li>▪ The Phase 3 program will begin in January 2009. Parties interested in participating should contact the Program Manager for details.</li><li>▪ Recent reports: can be found on the CCP2 website: <a href="http://www.co2captureproject.org/index.htm">http://www.co2captureproject.org/index.htm</a></li></ul>

*CO<sub>2</sub> GeoNet*  
*CSLF Project Status Report (PSR)*  
*December 2008*

<b>1. Project Location</b>
Western Europe
<b>2. Project Lead</b>
<ul style="list-style-type: none"><li>▪ Coordinator: Dr. Nick Riley (British Geological Survey)<ul style="list-style-type: none"><li>- e-mail: <a href="mailto:njr@bgs.ac.uk">njr@bgs.ac.uk</a></li></ul></li><li>▪ Network Manager: Isabelle Czernichowski-Lauriol (BRGM)</li><li>▪ Secretariat: Sergio Persoglia (OGS)</li><li>▪ Contact: <a href="mailto:info@co2geonet.com">info@co2geonet.com</a></li></ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"><li>▪ Focus is R&amp;D into geological storage of CO<sub>2</sub> and strengthening the European Research Area.</li><li>▪ Form a durable integration of the original 13 partners over 5 years, involve more partners.</li><li>▪ Provide the underpinning science capability and knowledge to help enable deployment of large scale CO<sub>2</sub> storage in Europe as quickly as possible</li><li>▪ Collaborate internationally</li><li>▪ Be a source of impartial scientific information on CO<sub>2</sub> geological storage for stakeholders</li><li>▪ Train existing and new researchers</li><li>▪ Develop and share research infrastructure</li></ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>▪ In April 2008 formed a legal entity, “CO<sub>2</sub> GeoNet Association”- this will enable new strategic partners to join and existing partners to continue working together</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>▪ CO<sub>2</sub> GeoNet’s new brochure available in English, French and Danish at <a href="http://www.co2geonet.eu">www.co2geonet.eu</a> The CO<sub>2</sub> GeoNet researchers have prepared basic answers to several frequently asked questions, as to how CO<sub>2</sub> geological storage can be carried out, under what circumstances it is possible, and what the criteria are for its safe and efficient implementation.</li><li>▪ Latest results of research presented at Annual Stakeholder workshop held April 2008. Included joint research projects on monitoring natural CO<sub>2</sub> sites at marine, lacustrine and terrestrial locations using remote sensing, geophysics and direct gas analysis techniques.</li><li>▪ Participated, as a partner, to 3 research proposals to EC under the FP7;</li><li>▪ Dissemination of scientific info and documents at the NoE booth during ESOF 2008 July, Barcelona, the biggest European event for science exchange and communication.</li><li>▪ Co-organization of two courses in spring 2009 on CCS and “Modeling chemical reactivity during CO<sub>2</sub> geological storage”.</li><li>▪ Workshop in February 2009 on CO<sub>2</sub> geological storage modeling;</li><li>▪ CO<sub>2</sub> GeoNet Open Forum in March 2009. Located as usual on San Servolo Island in the lagoon of the Gulf of Venice, the final Open Forum of CO<sub>2</sub>GeoNet under the EC contract of the 6th FP promises to be a major international event.</li><li>▪ As part of the European Science Foundation Research Conference Scheme, CO<sub>2</sub> GeoNet will be holding the event “CO<sub>2</sub> Geological Storage: Latest Progress”. The aim is to assess the advances made over the last decade in the field of CO<sub>2</sub> Geological Storage and the future challenges that must be faced.</li></ul>

- Network has world-class unique expertise in monitoring and understanding CO<sub>2</sub> migration in the shallow subsurface and ecosystem responses to CO<sub>2</sub> in marine, freshwater and terrestrial settings
- e-mail: [info@co2geonet.com](mailto:info@co2geonet.com) or at the CO<sub>2</sub> GeoNet website: <http://www.co2geonet.com>

**CO2CRC Otway Project**  
*CSLF Project Status Report (PSR)*  
December 2008

<b>1. Project Location</b>
Southwestern Victoria, Australia
<b>2. Project Lead</b>
Sandeep Sharma, CO2CRC, Kensington WA 6151, Australia, <ul style="list-style-type: none"><li>- Ph: 08 6436 8736</li><li>- Mob: 0412 515 494</li><li>- E-mail: <a href="mailto:ssharma@co2crc.com.au">ssharma@co2crc.com.au</a></li></ul>
<b>3. Project Objectives</b>
The Otway project has been designed to demonstrate geological storage and monitoring of CO <sub>2</sub> under Australian conditions. It aims to provide technical information on geosequestration processes, technologies and monitoring and verification regimes that will help to inform public policy and industry decision-makers and assurance to the community.
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>▪ Offset seismic acquisition with explosive source using permanently installed geophones in Naylor 1 (October 2008)</li><li>▪ Geochemical sampling using U-Tube set up on a monthly basis.</li><li>▪ Geochemical data analysis indicates CO<sub>2</sub> arrival at monitoring well in July 2008 within model prediction bounds</li><li>▪ Multiple site visits by local and international visitors.</li><li>▪ Community exercise with Local fire authority conducted in November.</li><li>▪ Over 35,000 tonnes of CO<sub>2</sub> have been injected to date and monitoring is ongoing.</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>▪ Seismic testing using permanently installed geophones to continue</li><li>▪ Repeat 3D seismic planned for January 2009</li><li>▪ Otway Stage 2 concepts discussed with regulators/CRC board and long lead items being ordered.</li></ul>

***CO<sub>2</sub> Separation from Pressurized Gas Stream Project***  
*CSLF Project Status Report (PSR)*  
 November 2008

<b>1. Project Location</b>
Kyoto, Japan (membrane module development) Pittsburgh, Pennsylvania, USA (testing)
<b>2. Project Lead</b>
Dr. Shingo Kazama, RITE (Research Institute of Innovative Technology for the Earth) <ul style="list-style-type: none"> <li>▪ E-mail: <a href="mailto:kazama@rite.or.jp">kazama@rite.or.jp</a></li> </ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"> <li>▪ Development of membrane material for molecular gate function and composite membrane of excellent CO<sub>2</sub> selectivity over H<sub>2</sub></li> <li>▪ Development of membrane module</li> <li>▪ Testing of the module (with NETL, USA)</li> </ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"> <li>▪ Improvement of membrane material for molecular gate function (2008FY)</li> <li>▪ Improvement of composite membrane of an excellent CO<sub>2</sub> selectivity over H<sub>2</sub> (2008FY)</li> <li>▪ Pencil membrane module production (2009FY)</li> <li>▪ Real gas pre-testing of pencil membrane module (2009FY)</li> <li>▪ Preproduction sample of commercial size membrane module (2010FY)</li> <li>▪ Real gas pre-testing of commercial size membrane module (2010FY)</li> <li>▪ Process simulation (2008FY-)</li> </ul>
<b>5. Status</b>
<ul style="list-style-type: none"> <li>▪ 1<sup>st</sup> duration: 11/2003 – 03/2006 Completed</li> <li>▪ Development of novel dendrimer materials for CO<sub>2</sub> separation</li> <li>▪ Fabrication of dendrimer composite membrane modules and their test</li> </ul> <p>References:</p> <p>Shingo Kazama, Teruhiko Kai, Takayuki Kouketsu, Shigetoshi Matsui, Koichi Yamada, James S. Hoffman, Henry W. Pennline, Experimental Investigation of a Molecular Gate Membrane for Separation of Carbon Dioxide from Flue Gas, Session 30, Proceedings of Pittsburgh Coal Conference, Pittsburgh, USA (2006)</p> <p>Takayuki Kouketsu, Shuhong Duan, Teruhiko Kai, Shingo Kazama*, and Koichi Yamada, “PAMAM Dendrimer Composite Membrane for CO<sub>2</sub> Separation: Formation of a Chitosan Gutter Layer”, <i>J. Membrane Sci.</i> 287 (2007) 51-59 and so on.</p> <ul style="list-style-type: none"> <li>▪ 2<sup>nd</sup> duration: 04/2006 – 03/2011 ongoing</li> <li>▪ Development of novel CO<sub>2</sub> molecular gating materials for a CO<sub>2</sub>/H<sub>2</sub> mixture</li> <li>▪ Test of dendrimer composite membrane under an elevated pressure (12/2007)</li> <li>▪ Accomplishment of a good CO<sub>2</sub>/H<sub>2</sub> selectivity at an elevated pressure (3/2008)</li> <li>▪ Improvement of CO<sub>2</sub> permeation rate of dendrimer composite membrane (12/2008)</li> </ul>

*CO<sub>2</sub>SINK - In situ R&D Laboratory for Geological Storage of CO<sub>2</sub> in a Saline Aquifer*  
*CSLF Project Status Report (PSR)*  
*December 2008*

<b>1. Project Location</b>
Ketzin, State of Brandenburg, Germany
<b>2. Project Lead</b>
GeoForschungsZentrum Potsdam, German Research Centre for Geosciences (GFZ) Telegrafenberg, D-14473 Potsdam; <a href="http://www.gfz-potsdam.de">http://www.gfz-potsdam.de</a> Coordinator: Prof. Dr. Frank Schilling Tel: +49.331.288-1510; Fax: +49.331.288-1502; E-mail: <a href="mailto:fsch@gfz-potsdam.de">fsch@gfz-potsdam.de</a> Project website: <a href="http://www.co2sink.org">http://www.co2sink.org</a>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"> <li>▪ Developing a basis for geologic storage of CO<sub>2</sub> into a saline aquifer</li> <li>▪ Establishing the first European in-situ laboratory for onshore storage of CO<sub>2</sub></li> <li>▪ Creating a field laboratory with one injection well and two observation wells</li> <li>▪ Characterization of flow and reaction processes in geologic storage, including detailed analysis of samples of rocks, fluids and microorganisms from the underground reservoir</li> <li>▪ Intensive monitoring of the injected CO<sub>2</sub> using a broad range of geophysical (time-lapse seismic, electrical and thermal), geochemical and microbiological techniques</li> <li>▪ Development and benchmarking of numerical models</li> <li>▪ Definition and testing of risk-assessment strategies</li> </ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"> <li>▪ Feb./May 2007: Spud-in of the CO<sub>2</sub>SINK injection and observation wells</li> <li>▪ June 13, 2007: Opening of the Ketzin Field Lab, CO<sub>2</sub> Storage Site and Info Centre</li> <li>▪ Sept. 8, 2007: One injection and two observation wells drilled and cemented (smart wells with electrical and fibre-optical permanent sensors behind casing)</li> <li>▪ Feb. 8, 2008: Injection facility installed and tested</li> <li>▪ Feb. 29, 2008: Hydraulic testing successful</li> <li>▪ June 18, 2008: Final lifting of injection and observation wells; slug injection</li> <li>▪ June 24, 2008: Commissioning of injection facility, start of injection test phase</li> <li>▪ June 30, 2008: Start of CO<sub>2</sub> injection</li> <li>▪ Nov. 17, 2008: Presentation of the CO<sub>2</sub>SINK Status Report to GHGT-9, Washington</li> </ul>
<b>5. Status</b>
<ul style="list-style-type: none"> <li>▪ 5-years lifetime 04/2004 - 03/2009; extension of project lifetime is applied for</li> <li>▪ July 2008: start injection of up to 60,000 tonnes CO<sub>2</sub></li> <li>▪ Nov 2008: 4500 tonnes of CO<sub>2</sub> injected till now</li> </ul> <p>Completed subprojects:</p> <ul style="list-style-type: none"> <li>▪ Storage site development</li> <li>▪ Baseline Storage Site Modeling</li> <li>▪ GeoEngineering: drilling, coring, pre-injection logging</li> </ul> <p>Ongoing subprojects:</p> <ul style="list-style-type: none"> <li>▪ Rock/fluid interactions laboratory experimentation</li> <li>▪ Economic/ecological analysis and safety concepts</li> <li>▪ CO<sub>2</sub> supply, transport, intermediate storage, conditioning and injection</li> <li>▪ Geophysical and geochemical borehole and surface MMV of CO<sub>2</sub> storage</li> </ul>

- Project coordination and public outreach
- Preparation (permitting and operation) of CO<sub>2</sub> wellbore abandonment and post-injection MMV

The present state of the CO<sub>2</sub>SINK Integrated Project has been summarized in the Proceedings of GHGT-9 by *Schilling, F. Borm, G. Wuerdemann, H. Moeller, F., Kuehn, M. and the CO<sub>2</sub>SINK Group: Status Report on the First European on-shore CO<sub>2</sub> Storage Site at Ketzin (Germany)* and illustrated by 5 technical posters to GHGT-9 on specific topics of the project..

***Dynamis Project***  
*CSLF Project Status Report (PSR)*  
*January 2009*

<b>1. Project Location</b>
<ol style="list-style-type: none"><li>1. East-Midlands (UK) – coal-based IGCC with an integrated hydrogen bleed, providing 2.2 Mtpa CO<sub>2</sub> for southern North Sea-based off-shore aquifer storage (sponsor: E.ON UK),</li><li>2. North-East UK – coal-based IGCC with integrated hydrogen bleed, providing 2.2 Mtpa CO<sub>2</sub> intended for EOR in North Sea-based off-shore operations (sponsor: Progressive Energy Ltd.),</li><li>3. Mongstad (Norway) – natural gas CHP, post combustion with separate hydrogen production, providing 1.3 Mtpa CO<sub>2</sub> for North Sea-based off-shore aquifer storage in the Johansen formation (Sponsor: StatoilHydro), and</li><li>4. Hamburg (Germany) – coal-based IGCC with an integrated hydrogen bleed and district heating off-take, providing 2.2 Mtpa CO<sub>2</sub> for aquifer storage (Sponsor: Vattenfall)</li></ol>
<b>2. Project Leads</b>
In the DYNAMIS project Charles Eickhoff is leading the case studies: - e-mail: <a href="mailto:charles@progressive-energy.com">charles@progressive-energy.com</a>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"><li>• See item 1 above. Cases 1, 2 and 4 are pre-combustion plants, whereas case 3 is post-combustion. All includes CCS with geological storage. Some includes hydrogen production.</li><li>• Overall objective: To pave the ground for co-production of electric power and hydrogen with CCS.</li></ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>• A comprehensive multi-criteria assessment approach has been used for the screening and pre-selection of the recommended sites for plant and storage in Europe.</li><li>• The four case studies have now passed the technical and environmental assessments, and are being further detailed.</li><li>• Impacts on legal aspects, financibility and public perceptions are furthermore being included in the assessments of a typical demonstration case.</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>• See item 4. The progress is according to plan.</li><li>• Contractually the DYNAMIS project will be terminated at the end of February 2009.</li><li>• Some related actions - funded by the industry - will survive the project. The results thereof will (intentionally) be reported in a specific seminar later this year.</li></ul>

***Frio Brine Pilot Project***  
***CSLF Project Status Report (PSR)***  
***December 2008***

<b>1. Project Location</b>
South Liberty oilfield, east of Houston, Texas, USA
<b>2. Project Lead</b>
<ul style="list-style-type: none"><li>▪ Susan Hovorka, Gulf Coast Carbon Center, The Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin, USA<ul style="list-style-type: none"><li>- e-mail: <a href="mailto:susan.hovorka@beg.utexas.edu">susan.hovorka@beg.utexas.edu</a></li></ul></li><li>▪ Tom Daley, Lawrence Berkley National Lab, Berkeley, California, USA</li><li>▪ Yousif Kharaka, U.S. Geological Survey, Menlo Park, California, USA</li></ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"><li>▪ Project Goal: Early success in a high-permeability, high-volume sandstone representative of a broad area that is an ultimate target for large-volume sequestration.</li><li>▪ Demonstrate that CO<sub>2</sub> can be injected into a brine formation without adverse health, safety, or environmental effects</li><li>▪ Determine the subsurface distribution of injected CO<sub>2</sub> using diverse monitoring technologies</li><li>▪ Demonstrate validity of conceptual and numerical models</li><li>▪ Develop experience necessary for success of large-scale CO<sub>2</sub> injection experiments</li></ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"><li>▪ Second injection completed October 1, 2006</li><li>▪ Confirm no-detect at surface of perfluorocarbon tracers</li><li>▪ Post injection monitoring of second injection completed September 2007</li><li>▪ Permission to plug and abandon both wells has been received</li></ul>
<b>5. Status</b>
<ul style="list-style-type: none"><li>▪ Project is approaching completion</li><li>▪ Post- injection stable conditions attained – monitoring program nearing completion</li><li>▪ Final repeat VSP prior to plug and abandon scheduled for winter 2008</li><li>▪ Two short duration injection tests completed: Frio 1, Oct 2004; Frio 2 September 2006</li><li>▪ Assessment of storage permanence – quantifying residual saturation and dissolution of year long period following injection</li><li>▪ No change in status since September 2008 report</li><li>▪ Reports can be found at <a href="http://www.gulfcoastcarbon.org">http://www.gulfcoastcarbon.org</a></li></ul>

***In Salah, Industrial-scale CO<sub>2</sub> Geological Storage***  
*CSLF Project Status Report (PSR)*  
*December 2008*

<b>1. Project Location</b>
In Salah, Algeria, Africa
<b>2. Project Lead</b>
Iain W. Wright, BP Alternative Energy, Chertsey Road, Sunbury, Middlesex TW16 7LN, UK
<b>3. Project Objectives</b>
<ul style="list-style-type: none"> <li>▪ Provide assurance that secure geological storage of CO<sub>2</sub> can be cost-effectively verified and that long-term assurance can be provided by short-term monitoring.</li> <li>▪ Demonstrate to stakeholders that industrial-scale geological storage of CO<sub>2</sub> is a viable GHG mitigation option.</li> <li>▪ Set precedents for the regulation and verification of the geological storage of CO<sub>2</sub>, allowing eligibility for GHG credits</li> </ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"> <li>▪ Results of satellite monitoring and fracture modeling published at GHGT-9 conference.</li> <li>▪ Mobilising a drilling rig to drill new micro-seismic monitoring well and shallow aquifer monitoring wells.</li> <li>▪ Quantified Risk Assessment updated</li> </ul>
<b>5. Status</b>
<ul style="list-style-type: none"> <li>▪ Storing 1mmtpa CO<sub>2</sub> in a deep saline aquifer (1900 deep, 2m thick, 10mD permeability).</li> <li>▪ Expect repeat seismic data acquisition in Q2 2009.</li> </ul>

**IEA GHG Weyburn-Midale CO<sub>2</sub> Monitoring and Storage Project - Final Phase**  
**CSLF Project Status Report (PSR)**  
*December 2008*

<b>1. Project Location</b>
Weyburn and Midale Units, Weyburn area, southeast Saskatchewan, Canada
<b>2. Project Lead</b>
<ul style="list-style-type: none"> <li>▪ Saskatchewan Energy and Resources – Floyd Wist, Chair of the Leading Sponsors Executive Committee (LSEC)</li> <li>▪ Natural Resources Canada (NRCan) – Frank Mourits, Project Integrator (including policy component of the project)</li> <li>▪ Petroleum Technology Research Centre (PTRC) – Carolyn Preston, Executive Director</li> <li>▪ PTRC – Steve Whittaker, Senior Project Manager (technical research component)</li> </ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"> <li>▪ Develop a comprehensive Best Practices Manual for CO<sub>2</sub> geological storage to guide all aspects of future CO<sub>2</sub>-EOR storage projects</li> <li>▪ Building on the successes of the First Phase, focus the technical research component on site characterization, wellbore integrity, monitoring and verification, and performance (risk) assessment</li> <li>▪ Focus the new policy component on public communications and outreach, regulatory issues and the business environment</li> <li>▪ Ensure integration across technical research and policy components</li> </ul>
<b>4. Recent Milestones (since February 2008 update)</b>
<ul style="list-style-type: none"> <li>▪ April 2008 – Decision by LSEC to extend the project completion date to March 31, 2011</li> <li>▪ May-June 2008 – Theme Leads hired for the Public Communications and Outreach and Regulatory Themes; consultant hired for business environment study</li> <li>▪ June 2008 – Second Project Integration and Sponsors Meeting (PRISM) held in Calgary</li> <li>▪ November 2008 – Regulatory Theme work program and budget approved by LSEC</li> <li>▪ December 2008 – Third PRISM meeting held in Edmonton</li> </ul>
<b>5. Status</b>
<ul style="list-style-type: none"> <li>▪ Status of Research Provider Agreements (RPA): <ul style="list-style-type: none"> <li>○ 10 RPAs have been executed</li> <li>○ three RPAs are still in the process of being completed</li> </ul> </li> <li>▪ A total of 27 technical research tasks have been approved by LSEC: <ul style="list-style-type: none"> <li>○ 3 tasks have been completed</li> <li>○ 17 tasks are underway or about to be started</li> <li>○ 7 tasks have yet to start</li> </ul> </li> <li>▪ Plans and cost estimates have been developed for three key proposed monitoring activities, including a permanent seismic array, an observation and monitoring well and a wellbore integrity downhole sampling project</li> <li>▪ Under the Regulatory Theme, various reports were completed, including a detailed survey of international regulatory initiatives on carbon storage. This survey will be published as a separate IEA report</li> <li>▪ A Public Communications and Outreach strategy, action plan and budget are being developed and will be submitted for approval by LSEC in early 2009</li> <li>▪ The sponsorship campaign is ongoing</li> </ul>

**Zama Acid Gas Enhanced Oil Recovery, CO<sub>2</sub> Sequestration, and Monitoring Project**  
**Carbon Sequestration Leadership Forum Project Status Report (PSR)**  
 December 2008

<b>1. Project Location</b>
Zama City, Alberta, Canada
<b>2. Project Leads</b>
<ul style="list-style-type: none"> <li>• Ed Steadman, Energy &amp; Environmental Research Center, Grand Forks, North Dakota, USA           <ul style="list-style-type: none"> <li>- e-mail: <a href="mailto:esteadman@undeerc.org">esteadman@undeerc.org</a></li> </ul> </li> <li>• Steven Smith, Energy &amp; Environmental Research Center, Grand Forks, North Dakota, USA           <ul style="list-style-type: none"> <li>- e-mail: <a href="mailto:ssmith@undeerc.org">ssmith@undeerc.org</a></li> </ul> </li> <li>• Bill Jackson, Apache Canada Ltd, Calgary, Alberta, Canada           <ul style="list-style-type: none"> <li>- e-mail: <a href="mailto:bill.jackson@apachecorp.com">bill.jackson@apachecorp.com</a></li> </ul> </li> </ul>
<b>3. Project Objectives</b>
<ul style="list-style-type: none"> <li>• To validate the sequestration of CO<sub>2</sub>-rich acid gas in a depleted oil reservoir.</li> </ul>
<b>4. Recent Milestones</b>
<ul style="list-style-type: none"> <li>• Twenty samples have been taken from Well 8-33-115-6W6M (acid gas disposal) for petrological and geochemical investigations on the effects of acid gas on the reservoir mineralogy. Thin sections for each of the samples have been prepared and are currently undergoing petrological investigation. Scanning electron microscope mounts have also been prepared and are currently being examined. X-ray diffraction determination of the mineralogy for each of the samples is complete, and the interpretation is under way. Samples for intercrystalline porosity–mass spectrometry analysis using strong acid digestion and X-ray florescence have been prepared and submitted for analysis and will be completed in the new year.</li> <li>• Ten samples were also obtained from the same well and will be analyzed for geomechanical strength and threshold properties.</li> </ul>
<b>5. Status</b>
<ul style="list-style-type: none"> <li>• Injection is ongoing. Over 20,000 tons of acid gas has been injected to date.</li> <li>• Geomechanical laboratory studies are ongoing.</li> <li>• Compilation of a best practices manual has been initiated.</li> </ul>