# Minutes of the Technical Group Meeting

**Seoul, Korea**
**Tuesday, 25 March 2014**

## LIST OF ATTENDEES

**Chair** Trygve Riis (Norway)

**Technical Group Delegates**

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|---|---|
| Australia: | Clinton Foster (*Vice Chair*), Richard Aldous |
| Brazil: | Ronaldo Amaral |
| Canada: | Stefan Bachu (*Vice Chair*), Eddy Chui |
| China: | Jiutian Zhang, Xiaochun Li |
| European Commission: | Jeroen Schuppers |
| France: | Didier Bonijoly |
| Japan: | Ryozo Tanaka |
| Korea: | Chang-Keun Yi, Chong Kul Ryu |
| Mexico: | Edgar Santoyo-Castelazo |
| Netherlands: | Paul Ramsak |
| Norway: | Jostein Dahl Karlsen, Lars Ingolf Eide |
| Saudi Arabia: | Ahmed Aleidan, Hamoud Alotaibi |
| South Africa: | Tony Surridge (*Vice Chair*) |
| United Kingdom: | Philip Sharman |
| United States: | Mark Ackiewicz, Geo Richards |

**Representatives of Allied Organizations**

IEA GHG: Tim Dixon

**CSLF Secretariat**

Richard Lynch

**Invited Speakers**

Kiyoung Park, Director General for Energy Efficiency & Climate Change Bureau, Ministry of Trade, Industry and Energy (MOTIE), Korea

Chonghun Han, Chairman of the Steering Committee, Korea Carbon Capture and Storage Association (KCCSA)

**Roundtable Participants**

Ashok Bhargava, Director, Energy Division, East Asia Department, Asian Development Bank (*Moderator*)

Felipe Flores Pinto, Counselor / Head of Trade Section, Embassy of Brazil (in Korea)

Jiutian Zhang, Deputy Director, ACCA21, Ministry of Science and Technology, China

Edgar Santoyo-Castelazo, Director of Technologic Innovation, SENER, Mexico

Tony Surridge, Senior Manager & Head of the Centre for Carbon Capture and Storage, SANEDI, South Africa

**Observers**

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| Asian Development Bank: | Annika Seiler |
| Canada: | Michael Monea |
| Korea: | Hwansoo Chang, Seung Phill Choi, Kyungyong Jang, Segyu Jang, Seong Jegarl, Dongkwan Kim, Hocheol Kim, Mihwa Kim |
| United States: | John Harju, Frank Morton, Katherine Romanak, Edward Steadman |

## 1. Chairman's Welcome and Opening Remarks

The Chairman of the Technical Group, Trygve Riis, called the meeting to order and welcomed the delegates and observers to Seoul.

Trygve Riis

Mr. Riis provided context for the meeting by mentioning that during this meeting the Technical Group would be moving forward on its Action Plan, with the possibility of forming new task forces. However, this would depend in part on appraisals on proposed actions to be presented later in the meeting. Mr. Riis noted that two currently active task forces will be providing updates, as will the Projects Interaction and Review Team (PIRT) which will be describing the process for future updates of the CSLF Technology Roadmap.

In closing, Mr. Riis also mentioned that the current meeting includes a Roundtable on Carbon Capture and Storage (CCS) Technologies and Projects for Emerging Economy Countries, moderated by the Asian Development Bank. And the meeting also includes an informative presentation about the current status of CCS in Korea by the Chairman of the Steering Committee of the Korea Carbon Capture and Storage Association.

## 2. Host Country Welcome

Kiyoung Park, Director General for Energy Efficiency & Climate Change Bureau at Korea's, Ministry of Trade, Industry and Energy, welcomed the CSLF Technical Group to Seoul and provided a keynote message for the meeting: For Korea and as well as many other countries, CCS can play an important role in greenhouse gas emissions reductions while preserving the option of using coal and other abundant fossil energy resources. Dr. Park stated that the Korean government has set a national master plan in 2010 to pave the way for commercial deployment of advanced CCS technologies by the year of 2020. In

line with the plan, Korea has made an investment of US$137 million in carbon capture research, which includes two 10-megawatt post-combustion $CO_2$ capture pilot plants. Dr. Park also stated that, regarding $CO_2$ storage, Korea has determined a candidate storage site in the sub-seabed Ulleung Basin of the East Sea, which has the potential to store 5 billion metric tons of $CO_2$.

Dr. Park closed by stating that Korea is working toward a large-scale CCS demonstration, but in light of the many political and technological barriers to overcome, desires to work with other countries to share best practices to overcome these barriers. For that reason, Korea has a great interest in the CSLF as a platform to share information.

Kiyoung Park

## 3. Introduction of Delegates

Technical Group delegates present for the meeting introduced themselves. Fifteen of the twenty-three CSLF Members were present, including representatives from Australia, Brazil, Canada, China, the European Commission, France, Japan, Korea, Mexico, the Netherlands, Norway, Saudi Arabia, South Africa, the United Kingdom, and the United States. Observers representing the Asian Development Bank, Canada, Korea, and the United States were also present.

## 4. Adoption of Agenda

The Agenda was adopted without change.

## 5. Approval of Minutes from Washington Meeting

The Minutes from the November 2013 Technical Group Meeting in Washington were approved without change.

## 6. Review of Action Items from Washington Meeting

Richard Lynch provided a brief summary of the nine action items resulting from the Washington meeting. All have been completed or are in progress. For one of the action items, Tony Surridge stated that a study, conducted by the South African Center for Carbon Capture & Storage (SACCCS), on the impacts of CCS on South African national priorities beyond climate change had been completed but was still undergoing final review. Dr. Surridge was requested to alert the Secretariat when a final version is available, and the Secretariat will pass this information on to the Technical Group.


Richard Lynch

## 7. Report from CSLF Secretariat

Richard Lynch gave a brief presentation that summarized ongoing CSLF activities for both the Policy Group and Technical Group. Currently, the Policy Group has two existing task forces, on Financing CCS and on Capacity Building, and has also formed an Exploratory Committee toward creating a forward action plan. The Exploratory Committee has identified five main areas of interest, two of which may involve the Technical Group. The Policy Group is planning to convene twice in 2014. There will be a stand-alone Policy Group meeting tentatively scheduled for June at a yet-to-be-determined location, and the 2014 CSLF Annual Meeting, which will take place sometime in the 4th quarter at a yet-to-be-determined location. The Secretariat was requested to obtain clarification on specific dates and locations for these meetings.

The Technical Group currently has two active task forces, plus the PIRT. Concerning the Technical Group's Action Plan, Mr. Lynch stated that the Secretariat had prepared a status report that is one of the current meeting's room documents. Of the original twelve identified actions from 2011, three are now complete, two are ongoing, and one has been cancelled. Decisions on whether or not to proceed on the remaining six, as well as for the proposed new action on sub-seabed $CO_2$ geologic storage, would be addressed later in the meeting. Also, one additional action, on review of $CO_2$ storage efficiency in deep saline aquifers, was added to the Action Plan in 2013 and is currently in progress.

Mr. Lynch also mentioned that he and John Panek (who was not able to attend the current meeting) had written a paper on behalf of the Secretariat for the March 2014 issue of *Petroleum Review*, summarizing the outcomes of 2013 CSLF Ministerial Meeting.

## 8. CCS in Korea

Chonghun Han

Chonghun Han, Chairman of the Steering Committee for the Korea Carbon Capture and Storage Association (KCCSA), gave a presentation that described the status of CCS in Korea. The Republic of Korea is currently the 8th greatest greenhouse gases emitter, with $CO_2$ emissions expected to reach more than 800 million tonnes per year by the year 2020 under a "business-as-usual" scenario. To prevent this from happening, the Government of Korea has implemented a National Plan for reducing $CO_2$ emissions, with a target of 30% reduction from the "business-as-usual" baseline. CCS is expected to play an important role in achieving this goal and, to that end, a Korean National Roadmap for CCS was created in 2009 and Korea's "Nationwide CCS Development Plan" was published in 2010. Power plants are the largest stationary $CO_2$ emissions sources in Korea, accounting for about one-fourth of the total $CO_2$ emitted. Because of this, CCS demonstrations are being planned and implement at coal-fueled power plant sites.

Prof. Han reported that there is much R&D activity in progress concerning $CO_2$ capture. A post-combustion amine-based 0.1 megawatt small pilot unit was operated at the Boryeong Thermal Power Station, in western Korea, between 2010 and 2011; this has now been scaled-up to a 10 megawatt large pilot also at Boryeong. Early test results have shown a greater than 90% $CO_2$ capture rate with greater than 99% $CO_2$ purity. Concurrently, another 10 megawatt post-combustion pilot plant is in operation at Hadong Thermal Power Station in southern Korea; this facility utilizes a dry potassium carbonate

regenerable sorbent which has an 85% $CO_2$ capture rate with greater than 95% $CO_2$ purity. One or both of these processes could have a commercial-scale demonstration by about the year 2018.

Prof. Han stated that work is also progressing on identification and characterization of potential $CO_2$ storage sites. The largest and most promising is the sub-seabed Ulleung Basin off the eastern coast of Korea, but there are also potential onshore sites being looked at in the southeastern and south-central parts of the country. $CO_2$ storage will be part of the commercial-scale demonstrations planned for 2018. Prof. Han also mentioned that there is ongoing research in Korea toward $CO_2$ industrial applications, including $CO_2$ capture in the steel industry, $CO_2$ conversion using microalgae, and use of $CO_2$ as chemical feedstock for a $CO_2$-epoxide copolymer which has potential as a food packaging material. It is Korea's intention to keep investing in CCS R&D but it needs international collaboration, especially regarding $CO_2$ storage.

Prof. Han closed his presentation by mentioning that the KCCSA, which came into existence in 2010 as a result of the Nationwide CCS Development Plan, now includes as members all the major players in Korea's power generation, petroleum, and engineering / construction corporations, and it's bimonthly newsletter has a distribution list of about 62,000 recipients. KCCSA is an active participant in international CCS networks and is involved in development of a regulatory / incentive system that is expected to encourage CCS commercialization in Korea.

## 9. Update from the IEA Greenhouse Gas R&D Programme

Tim Dixon

Tim Dixon gave a presentation about the IEA GHG and its ongoing collaboration with the CSLF's Technical Group. The two organizations have mutual representation (without voting rights) at Technical Group and IEA GHG Executive Committee meetings, and the IEA GHG has liaison with the CSLF's Projects Interaction and Review Team in a two-way process for discussing potential activities and projects. A major activity of the IEA GHG this year is organization of the GHGT-12 conference in the United States on 5-9 October (in Austin, Texas). This biennial event is the largest and most comprehensive conference related to CCS.

Based on an agreement made back in 2008, the Technical Group is offered the opportunity to propose studies to be undertaken by the IEA GHG. These, along with proposals from IEA GHG Executive Committee (ExCo) members, go through a selection process at semiannual ExCo meetings. So far there have been three IEA GHG studies that originated from the CSLF Technical Group: "Development of Storage Coefficients for $CO_2$ Storage in Deep Saline Formations" (March 2010), "Geological Storage of $CO_2$ in Basalts" (September 2011), and "Potential Implications of Gas Production from Shales and Coal for $CO_2$ Geological Storage" (November 2013). Mr. Dixon stated that new ideas for future studies are welcome, and that the next deadline for proposal outlines is on 19 June 2014.

## 10. Update from the Global CCS Institute

Clinton Foster gave a brief presentation on behalf of the GCCSI, whose representative was not able to attend the meeting. The mission of the GCCSI is to accelerate the development, demonstration and deployment of CCS globally. The methodology for doing this is through knowledge sharing, fact-based advice and advocacy, and working to create favorable conditions for implementation of CCS. The GCCSI has had more than 600 publications on a variety of topics related to CCS including its flagship report, "The Global Status of CCS", which was launched in October 2013 and updated in February 2014. The GCCSI also collaborates with several organizations, including the CSLF, and the focus of the collaboration with the CSLF is on capacity building and knowledge sharing.

Dr. Foster also stated that the GCCSI recently created the "**decarboni.se**" website, which presents an opportunity for CSLF outcomes to gained wider visibility. This is intended to be a knowledge hub for CCS and other low carbon technologies, providing platforms for organizations and corporations to build knowledge-sharing mini-websites within the knowledge hub. The CSLF is one of more than 400 such organizations.

Trygve Riis, speaking for the Technical Group, expressed appreciation for the GCCSI's continuing involvement in CSLF activities.

## 11. Report from the CSLF Projects Interaction and Review Team (PIRT) and Update on the CSLF Technology Roadmap

Clinton Foster

The PIRT Chair, Clinton Foster, gave a short presentation that summarized the previous day's PIRT meeting. Outcomes from the meeting were:

- Three new Active members were added to the PIRT: Jiutian Zhang (China), Edgar Santoyo-Castelazo (Mexico), and Paul Ramsak (Netherlands).
- The PIRT will continue its collaborations with other CCS organizations in the area of knowledge sharing. To that end, the GCCSI's "**decarboni.se**" website will be linked from the CSLF website.
- The PIRT will gather information on the eight "Identified Technology Needs" that were described in the 2013 CSLF Technology Roadmap (TRM). The CSLF Secretariat will develop templates for this purpose which will be sent to representatives of other CCS organizations.
- New working groups will be formed within the PIRT to examine information received concerning the eight TRM needs areas:

  Area #1: $CO_2$ Capture Technologies in Power Generation (*Norway*)

  Area #2: $CO_2$ Capture in Industrial Sector (*South Africa* and *United Kingdom*)

  Area #3: $CO_2$ Transport (*Australia*)

  Area #4: Large-Scale $CO_2$ Storage (*Japan* and *France*)

  Area #5a: Monitoring (*United States* and *France*)

  Area #5b: Mitigation / Remediation (*European Commission*)

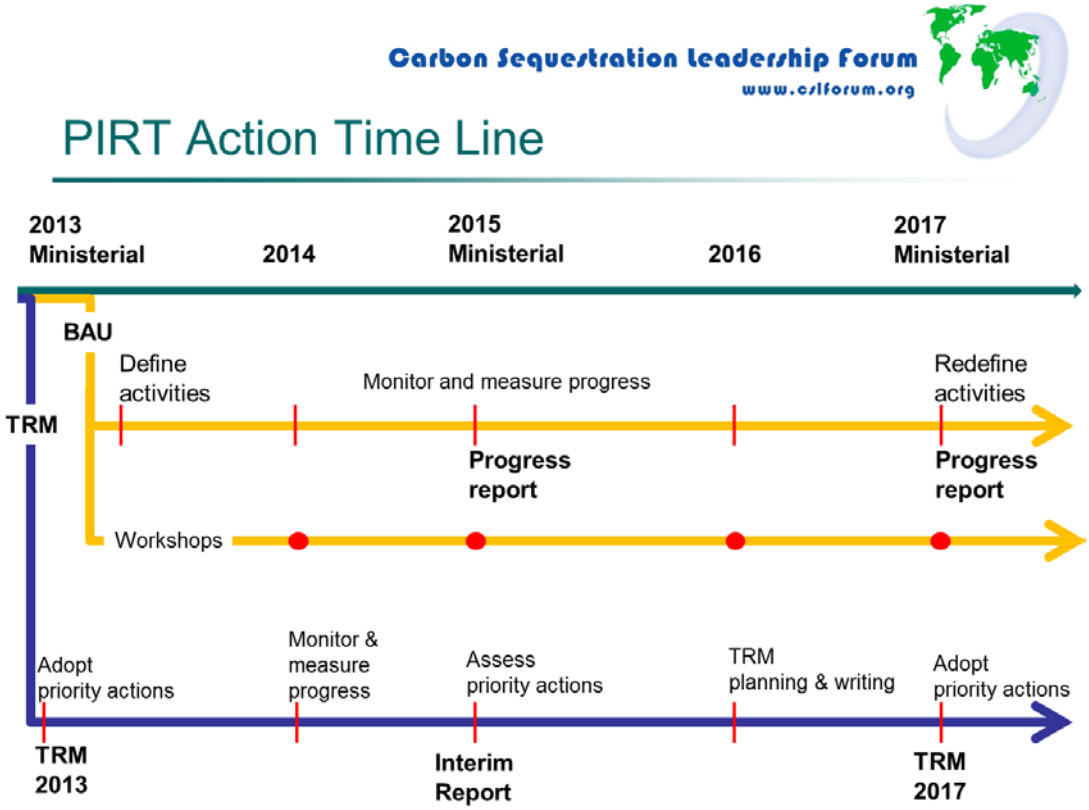
Area #6: Understanding the Storage Reservoirs (*United Kingdom* – to be confirmed)

Area #7: Infrastructure (*United Kingdom* – to be confirmed)

Area #8a: $CO_2$ Utilization, non-Enhanced Oil Recovery [EOR] (*France* – to be confirmed)

Area #8b: $CO_2$ Utilization, EOR (*Saudi Arabia*)

- There will not be a major rewrite of the TRM until 2017 (see chart). Results of the information gathering survey would be used to develop a 2014 Progress Report Addendum for the 2013 TRM and potentially a 2015 Interim Report for the next CSLF Ministerial Meeting.




Ensuing discussion focused on the TRM and associated information gathering activities. Didier Bonijoly noted that even though France is shown as lead or co-lead for several of the needs areas, it may not be possible, due to the amount of work involved, to actively participate in all of them. Philip Sharman noted that while this information survey would pertain more toward year 2020 CCS goals, the longer-term objectives for 2030 and 2050 should also be taken into account – fundamental research on advanced capture processes and next generation demonstration projects will be needed as time goes on, and these should be part of any projected timeline. Stefan Bachu agreed, stating that by the next Ministerial Meeting, it would likely not be enough time for any new advances to make it to demonstration by the year 2020. Because of this, Dr. Bachu suggested that for the next major TRM rewrite, the Technical Group should move its focus to beyond the year 2020. Lars Ingolf Eide also agreed, and mentioned that this change in focus outward from 2020 should be part of any joint activities the Technical Group has with the Policy Group, since the Policy Group is now discussing 2$^{nd}$ and 3$^{rd}$ generation technologies as it develops its

own action plan. However, Trygve Riis commented that even though lengthening the focus of the TRM to 2030 makes sense, shorter-term recommendations are still important as these would be of more immediate interest to the CSLF Ministers when they next meet.

## 12. Report from Review of $CO_2$ Storage Efficiency in Deep Saline Aquifers Task Force

Stefan Bachu

The Task Force Chair, Stefan Bachu, gave a brief update on the task force and its timeline. Dr. Bachu reported that this task force was established at the previous CSLF Technical Group Meeting, in November 2013, and has the mandate to critically review, compile and report on relevant literature published since the 2007 final report by the CSLF Task Force for Review and Identification of Standards for $CO_2$ Storage Capacity Estimation. The new task force has so far identified and collected more than 70 published papers and reports, as well as several that are yet to be published and presented. Outcomes from the task force's activities will lead to the refinement of values for storage capacity coefficients for deep saline aquifers, and as a result, update of known $CO_2$ storage capacities for these reservoirs. A draft of the task force's final report is expected to be complete in time for the 2014 CSLF Annual Meeting with a final version ready in time for the 2015 Technical Group Meeting.

During the ensuing discussion, Jostein Dahl Karlsen inquired if actual field information from ongoing projects would be reviewed in addition to published literature. Dr. Bachu responded that this would probably not be possible because these projects will not have reached the end of their injection stages in time for the task force's report, and also because some if not most of this field information would likely be proprietary. Ahmed Aleidan and Ryozo Tanaka both asked what kind of methodologies were used to develop values for storage coefficients, and Dr. Bachu clarified that these were determined based on numerical simulations. Richard Lynch inquired if outcomes from the task force would invalidate information contained in $CO_2$ storage atlases that have been published. Dr. Bachu replied that, at a minimum, any storage atlases published prior to 2007 would be obsolete because of the evolving methodology for determining these storage estimates.

## 13. Report from Reviewing Best Practices and Standards for Geologic Storage and Monitoring of $CO_2$ Task Force


Lars Ingolf Eide

The Task Force Chair, Lars Ingolf Eide, gave a brief report on the activities of this task force. The task force mandate was to perform initial identification and review of standards for storage and monitoring of injected $CO_2$. In the two years of its existence, the task force has completed annual reports that compiled listings of Best Practices Manuals (BPMs) that have been issued by various projects and organizations. Mr. Eide stated that the task force had intended to move onto Phase 2 activities, which would have had a focus of outlining/designing a web-based solution that can be

used for future annual updates. However, sufficient resources to continue this activity have not been forthcoming. Also, there are indications that other organizations such as the European Commission's $CO_2$ GeoNet Project and the ISO TC265 committee on CCS may be planning similar activities. For these reasons, Mr. Eide recommended that the task force be discontinued. Mr. Eide also suggested that the task force's compilation of BPMs be translated to a web-based product at the CSLF website and there was consensus for the Secretariat to make this transition. Mr. Eide was requested to inquire with the $CO_2$ GeoNet Project to determine what reports and outreach activities are planned concerning BPMs.

After brief discussion, there was consensus that this task force has concluded its work.

**14. Report on Barriers and Technical Needs for Sub-Seabed Storage of $CO_2$**

Mark Ackiewicz gave a short presentation that proposed creation of a new task force on offshore $CO_2$ storage. The November 2013 Technical Group Meeting in Washington had included a presentation on offshore carbon storage, but there was no consensus at that time for a new task force in this area. Subsequently, the United States volunteered to lead such a task force. Mr. Ackiewicz stated that offshore sub-seabed geologic storage can create additional $CO_2$ storage opportunities and may have several advantages, including avoidance of issues associated with heavily populated onshore areas and utilization of other subsurface resources.

Mark Ackiewicz

Mr. Ackiewicz stated that a new task force in this area would provide a current assessment on the status of the global sub-seabed storage potential, including potential for offshore EOR. The task force would also identify technical barriers and challenges to sub-seabed $CO_2$ storage (such as site characterization, monitoring, and $CO_2$ transport) as well as R&D opportunities. Identification of any existing projects characterization activities of this nature would also be part of the task force's activities, and the task force would also identify potential opportunities for global collaboration. Mr. Ackiewicz stated that the proposed new task force would be able to make a progress report at the next CSLF Annual Meeting, and would plan for a draft of its final report to be completed by the end of 2014. A final version of the report would be ready in time for the 2015 Technical Group Meeting.

Ensuing discussion resulted in consensus to create the new task force. Philip Sharman, Ryozo Tanaka, Lars Ingolf Eide, and Tim Dixon all volunteered to participate, though Mr. Eide stated that since Statoil in Norway had been doing sub-seabed injection of $CO_2$ for many years, there should be an effort to have Statoil representation in the task force. Clinton Foster suggested that the name of the new task force not include the word 'barriers' due to its negative connotation. Mr. Ackiewicz agreed, and the new task force will henceforward be known as the Offshore $CO_2$ Storage Task Force.

## 15. Analysis of IEA GHG Report on Interaction of $CO_2$ Storage with Subsurface Resources

Didier Bonijoly

Didier Bonijoly gave a short presentation that appraised the state of knowledge (based on his review of the IEA GHG Report 2013-08) concerning the proposed Technical Group Action Plan item on "Competition of CCS with Other Resources" in order to determine if the Technical Group should form a new task force in this area. Dr. Bonijoly stated that there were many potential subsurface resources considered in the IEA GHG report, including conventional oil and gas, shale gas and oil, coal, gas hydrates, natural gas storage, geothermal energy, groundwater, mineral deposits, and even nuclear waste repositories. The findings from this analysis were that risk assessments would probably be necessary concerning some of these subsurface resources but overall, the IEA GHG report and associated documentation were complete and pertinent, and there was no particular need for complementary work from the CSLF Technical Group.

After brief discussion there was consensus that the Technical Group will not form a new task force on this topic.

## 16. Appraisal of Proposed Technical Group Actions concerning CCS with Industrial Emissions Sources


Tony Surridge

Tony Surridge gave a short presentation concerning the proposed Technical Group Action Plan item on "CCS with Industrial Emissions Sources". Dr. Surridge's presentation described results of a South African case study of carbon emitters in and near the city of Durban, which is relatively close to a potential offshore sub-seabed storage site, and like many industrialized areas, is host to a large number of relatively small carbon emitters and a small number of large emitters. The large emitters are, individually, potential CCS opportunities, and it may also be possible to "pool" $CO_2$ streams from some of the smaller emitters such that the aggregate stream is of sufficient scale to warrant interest for CCS. There are many factors – policy, economic, and technical – that would enter into any decision on whether to proceed toward implementation of CCS projects.

Dr. Surridge's presentation did not make a recommendation on whether or not there should be a new Technical Group task force to further investigate this area, but ensuing discussion led to the conclusion that there may be some worth in further pursuing this topic. Lars Ingolf Eide mentioned that there has been a four-year project in Norway on industrial $CO_2$ emissions, which will wrap up with a workshop in June. Philip Sharman stated that there has been an ongoing study in the United Kingdom about CCS in industrial sectors, with a report due later in 2014. In the end, there was agreement to defer a decision on forming a new task force until the next Technical Group meeting

when a final determination would be made, so that results from the Norway workshop and the United Kingdom report can first be reviewed and considered.

Dr. Surridge mentioned that there will also be a brief "framework" report from South Africa on this topic, but it will first need to be reviewed before it can be released for wider distribution. The United Kingdom, United States, Norway, and the IEA GHG all volunteered to review the report, and Dr. Surridge agreed to send the final report to the Secretariat for posting at the CSLF website.

## 17. Appraisal of Proposed Technical Group Actions concerning Energy Penalty Reduction and Carbon Neutral / Carbon Negative CCS

Philip Sharman

Philip Sharman provided short appraisals on whether or not the Technical Group should form new task forces concerning the proposed Technical Group Action Plan items on "Energy Penalty Reduction" and "Carbon Neutral / Carbon Negative CCS". Concerning "Energy Penalty Reduction", Mr. Sharman stated that results from the United Kingdom's CCS Cost Reduction Task Force has been a useful stepping-off point for broader analysis, and that front-end engineering design (FEED) studies have been recently launched on the United Kingdom's commercial-scale Peterhead and White Rose projects. Outcomes from these studies would be extremely pertinent, but would not be available in time for use by a new Technical Group task force in this area. Mr. Sharman also stated that the United Kingdom is in the process of forming several new fora and networks, including one on knowledge transfer, which would most likely be addressing energy penalty reduction aspects for CCS. For these reasons, Mr. Sharman suggested that the Technical Group defer any decision on forming a new task force until the next Technical Group meeting, at which enough new information may be available such that a final determination can be made. There was consensus to accept this recommendation.

Concerning "Carbon Neutral / Carbon Negative CCS", Mr. Sharman stated that the European Commission's Zero Emissions Platform (ZEP) task force has already produced a report on this topic and that there were also other activities underway, including three IEA GHG studies. Mr. Sharman stated that these ongoing activities are providing very good coverage in this area and there did not seem to be any reason for the CSLF to form a new task force that would essentially duplicate some of these investigations. After brief discussion, there was consensus that the Technical Group will not form a new task force on this topic.

## 18. Appraisal of Proposed Technical Group Actions concerning Lifecycle Assessment and Environmental Footprint of CCS

Lars Ingolf Eide provided his appraisal concerning the proposed Technical Group Action Plan item on "Lifecycle Assessment and Environmental Footprint of CCS", and recommended that the Technical Group should not form a new task force on this topic. Mr. Eide stated that there are some definite resource considerations if a new task force were to be formed, as it is a big undertaking to evaluate lifecycle assessments. Also, any new task force might duplicate activities of the ISO TC265 committee on CCS, which has

this topic on its agenda. Mr. Eide suggested that, instead, it might be better if the IEA GHG played a role in this area. Tim Dixon replied that the IEA GHG would certainly be interested in entertaining a proposal for a study on this topic, and reminded that the deadline for proposal outlines is mid-June, as he had previously described. Proposals received by then would be evaluated at the IEA GHG's Executive Committee meeting in October.

After brief discussion, there was agreement that Mr. Eide and Mr. Dixon would jointly develop a proposal for a future IEA GHG study on lifecycle assessments.

## 19. Appraisal of Proposed Technical Group Actions concerning $CO_2$ Compression and Transport

Ryozo Tanaka

Ryozo Tanaka provided his appraisal concerning the proposed Technical Group Action Plan item on "$CO_2$ Compression and Transport", which concluded that while there are no significant challenges to be addressed concerning $CO_2$ compression, Technical Group activities concerning $CO_2$ transport might be worthwhile. However, Mr. Tanaka stated that Japan would like to decline the request to be the lead for a potential new task force on $CO_2$ transport because Japan's Ministry of Economy, Trade and Industry (METI) believes that Japan should put a higher priority on capture and storage, in particular offshore storage, than on $CO_2$ transport. Instead, Mr. Tanaka proposed that this Action Plan item become a part of the new Offshore $CO_2$ Storage Task Force. There was consensus for this proposal, and Mr. Tanaka volunteered to contribute to the new task force.

## 20. Roundtable Event: CCS Technologies and Projects for Emerging Economies


L-R: Tony Surridge, Edgar Santoyo-Castelazo, Felipe Flores Pinto, Jiutian Zhang, Ashok Bhargava

Richard Lynch introduced the Roundtable by stating that this event was intended to provide a depiction of how CCS would work best in emerging economy countries – what technologies would be of interest and what kinds of projects would make sense. Mr. Lynch then introduced the moderator, Ashok Bhargava of the Asian Development Bank (ADB), and the four panelists: Felipe Flores Pinto (representing Brazil), Jiutian Zhang (representing China), Edgar Santoyo-Castelazo (representing Mexico), and Tony Surridge (representing South Africa).

Mr. Bhargava provided a prolog to the Roundtable by stating that the ADB's Energy Division oversees a CCS dedicated fund of about US$70 million, which supports capacity

building, strategic analyses, project preparation activities, and financing of pilot projects, with emphasis on China and Indonesia. In 2014 the ADB expects to assist in the financing of two pilot projects. Each of the four panelists then provided a short scene-setting description that described CCS intentions for their countries. Mr. Pinto stated that fossil energy is not a major player in Brazil's energy mix, and the main interest was in developing offshore oil and gas reserves without venting $CO_2$ associated with this oil and gas. Dr. Zhang stated that China's growing need for sustainable sources of energy has led it to look for integrated solutions that solve more than just the issues related to $CO_2$, and that $CO_2$ utilization is also of interest. Dr. Santoyo-Castelazo stated that Mexico is a fast-industrializing country with an economy heavily dependent on fossil fuels, and that a new regulatory framework for climate change now being developed has created interest toward integrated CCS solutions, including CCS on gas-fired power plants. Dr. Surridge stated that South Africa's main focus has been on $CO_2$ storage with a pilot project in the planning stages, and that a proposed new carbon tax in South Africa would provide a strong impetus for CCS projects to happen. Ensuing discussion led to the following takeaways:

- CCS, as part of a suite of low carbon options, is becoming a national priority area for emerging economy countries. However, in some cases, lack of regulatory frameworks and other policy-related issues are holding back CCS.
- Resource allocation will always be an issue for implementing CCS in emerging economy countries, and funding is usually a zero-sum situation. Resources are limited, and the most urgent national needs get addressed first.
- Even though there are many similarities in the needs of emerging economy countries, each country has a specific set of circumstances in terms of national priorities, and this results in different strategies for implementing various aspects of CCS.
- One of the biggest challenges will be locating and characterizing $CO_2$ storage sites. While $CO_2$ capture and transport technologies can be brought in from the outside, $CO_2$ storage is always a local issue.
- Capacity building activities are essential to create in-country expertise for CCS in the developing world. The CSLF Capacity Building Program has been very beneficial, but much more is needed.

## 21. Discussion of the Need for New Technical Group Task Forces

Trygve Riis inquired if there were ideas for other possible additions to the Technical Group Action Plan. Jostein Dahl Karlsen offered that the Technical Group should embrace the concept of "policy relevance" (making Technical Group activities relevant to the Policy Group). For example, onshore CCS in Europe currently has considerable public acceptance issues to overcome, and as a result there may be an opportunity for the Technical Group to fashion "integrity of CCS" information for the layman which would capitalize on the real-world experiences of large-scale injection projects. Philip Sharman suggested that there may be some worth, in the future, for the Technical Group examining learnings from FEED studies, for instance a comparison of differences and similarities. Clinton Foster suggested that modeling techniques could be investigated, though there could not be appearance of an endorsement for any model.

To build on Mr. Karlsen's idea, Stefan Bachu stated that public outreach and communications was already part of the Policy Group's agenda, and this was an area where the Technical Group could provide tools for assisting the Policy Group. Ensuing

discussion led to a proposal for creation of a new exploratory committee to review available information on monitoring technologies at existing projects, which would support the Policy Group's public outreach activities. However, there was no immediate consensus to move forward in this area. Concerning this and the other suggestions, Mr. Riis stated that these will be discussed and firmed up during future Technical Group Executive Committee teleconferences.

**22. Possibilities for Collaboration with the CSLF Policy Group**

Trygve Riis informed the Technical Group about ongoing Policy Group activities for developing its own Action Plan. A Policy Group Exploratory Committee was formed at the November 2013 CSLF Ministerial Meeting and has held a series of teleconferences (in December and January) that resulted in consensus on five topics that would be a primary focus for near term Policy Group activities. Mr. Riis state that two of these topics are relevant to the Technical Group: supporting the development of 2nd and 3rd generation CCS technologies; and transitioning from $CO_2$-EOR to CCS. The latter topic was incorporated at the suggestion of the Technical Group. There was discussion on what the Technical Group's role might be for each of these items, but in the end there was the realization that these are still only proposals at this stage so no Technical Group activity is yet necessary. The upcoming Policy Group Meeting is expected to clarify the necessity for any Technical Group involvement.

**23. New Business**

There was no new business.

**24. Review of Consensuses Reached and Action Items**

Consensus was reached on the following items:

- The Reviewing Best Practices and Standards for Geologic Storage and Monitoring of $CO_2$ Task Force has concluded its work.
- A new Offshore $CO_2$ Storage Task Force is created and will be led by the United States.
- The Technical Group will not form a task force to address the Action Plan item on "Competition of CCS with Other Resources".
- The Technical Group will not form a task force to address the Action Plan item on "Carbon Neutral / Carbon Negative CCS".
- The Technical Group will not form a task force to address the Action Plan item on "Lifecycle Assessment and Environmental Footprint".
- The Technical Group will not form a task force to address the Action Plan item on "$CO_2$ Compression and Transport", instead incorporating this area into the new task force on "Offshore Sub-Seabed Storage of $CO_2$".
- The Technical Group will defer decisions on forming new task forces for the Action Plan items on "CCS with the Industrial Emissions Sources" and "Energy Penalty Reduction", and make final determinations on whether or not to address these items at the next Technical Group meeting.

Action items from the meeting are as follows:

| Item | Lead | Action |
|---|---|---|
| 1 | South Africa | Alert the Secretariat when the final version is available for the SACCCS report concerning impacts of CCS on South African national priorities beyond climate change. |
| 2 | CSLF Secretariat | Obtain clarification on the specific dates and locations for the June 2014 Policy Group meeting and the 2014 CSLF Annual meeting. |
| 3 | Norway | Inquire with the European Commission's $CO_2$ GeoNet Project to determine what reports and outreach activities are planned concerning BPMs. |
| 4 | CSLF Secretariat | Create a new page at the CSLF website for compilation of BPMs and other results from the Reviewing Best Practices and Standards for Geologic Storage and Monitoring of $CO_2$ Task Force. |
| 5 | United Kingdom, United States, Norway, IEA GHG | Review South African "framework" report on industrial sector CCS. |
| 6 | South Africa | Send finalized "framework" report to Secretariat for posting at CSLF website once it is ready. |
| 7 | Norway and IEA GHG | Develop a proposal for a future IEA GHG study on lifecycle assessments. |
| 8 | CSLF Secretariat | Update the Technical Group Action Plan. |

## 25. Closing Remarks / Adjourn

Trygve Riis expressed appreciation to the host country for bringing the Technical Group to Korea, and to Chong Kul Ryu in particular for all the work and preparation he did to make the meeting happen. Mr. Riis thanked the delegates, observers, and Secretariat for their hard work and active participation, and adjourned the meeting.