



## MEETING SUMMARY

Projects Interaction and Review Team (PIRT) Meeting

Warsaw, Poland

27 October 2014

Prepared by the CSLF Secretariat

### LIST OF ATTENDEES

#### PIRT Active Members

|                 |                               |
|-----------------|-------------------------------|
| Australia:      | Clinton Foster (Chair)        |
| Canada:         | Eddy Chui                     |
| China:          | Xian Zhang                    |
| France:         | Didier Bonijoly               |
| Japan:          | Ryozo Tanaka                  |
| Mexico:         | Giselle Pérez                 |
| Netherlands:    | Paul Ramsak                   |
| Norway:         | Trygve Riis, Lars Ingolf Eide |
| Saudi Arabia:   | Ahmed Aleidan                 |
| South Africa:   | Tony Surridge                 |
| United Kingdom: | Philip Sharman                |
| United States:  | John Litynski                 |
| IEA GHG:        | Tim Dixon                     |

#### Other CSLF Delegates

|                 |                                 |
|-----------------|---------------------------------|
| Australia:      | Zoe Naden                       |
| Korea:          | Seung-Phill Choi, Chang Keun Yi |
| Poland:         | Piotr Kisiel                    |
| Russia:         | Oleg Tailakov, Valerii Zakharov |
| South Africa:   | Landi Themba                    |
| United Kingdom: | Suk Yee Lam                     |

#### CSLF Secretariat

Richard Lynch, Adam Wong

#### Invited Speaker

Norway: Liv Bjerge, Project Manager, Norcem CO<sub>2</sub> Capture Project

#### Observers

|         |               |
|---------|---------------|
| France: | David Savary  |
| Poland: | Adam Wójcichi |

## 1. Welcome and Summary of Previous PIRT Meeting

PIRT Chairman Clinton Foster welcomed participants to the 22<sup>nd</sup> meeting of the PIRT and provided a brief summary of the March 2014 PIRT meeting in Seoul, Korea. At that meeting the PIRT reached consensus on the following:



Clinton Foster

- The PIRT will produce a short progress report on the CSLF's Technology Roadmap (TRM) in time for the 2014 CSLF Annual Meeting. The PIRT will also work toward producing an interim report on the TRM for the 2015 CSLF Ministerial Meeting and a new edition of the TRM in time for an anticipated 2017 CSLF Ministerial Meeting.
- Three new members (China, Mexico, and the Netherlands) were added to the PIRT's Active Membership core group.
- PIRT meetings will include updates from the Global Carbon Capture and Storage Institute (GCCSI) about its “**decarboni.se**” knowledge hub website and other CCS-related knowledge-sharing activities.

Dr. Foster noted that this was the first meeting under the PIRT's revised Terms of Reference, and briefly summarized the new procedures for how the PIRT will examine projects nominated for CSLF recognition:

- Project proposals should be circulated to PIRT Active Members by the CSLF Secretariat.
- No later than ten days prior to PIRT meetings, Active Members are asked to submit a free-text comment, either supporting or identifying issues for discussion, on each project nominated for CSLF recognition.
- At PIRT meetings or via proxy through the PIRT Chair, individual country representatives will be required to comment on projects nominated for CSLF recognition.
- Recommendations of the PIRT should be reached by consensus with one vote per Active Member country only.

Dr. Foster noted that these new procedures have worked very well for analysis of the Norcem CO<sub>2</sub> Capture Project, being considered at the current meeting, and thanked the PIRT Active Members who provided comments on the project.

## 2. Adoption of Meeting Agenda

The meeting Agenda was adopted with the addition of a short update on the CSLF-recognized Gorgon Project after the report on PIRT activities concerning knowledge-sharing (i.e., after Item 6 on the PIRT Agenda).

## 3. Introduction of Meeting Attendees

PIRT meeting attendees introduced themselves. In all, fifteen CSLF delegations were represented at the meeting.

#### 4. Approval of Meeting Summary from Seoul PIRT Meeting

The Meeting Summary from the March 2014 PIRT meeting in Seoul was approved as final with two minor adjustments to the draft document:

- For clarity, change the word “parsing” to “sorting” in the description of how information from the technology needs reporting template would be examined.
- Add Canada as a volunteer to examine information from technology needs reporting templates in the area of “CO<sub>2</sub> Utilization – Enhanced Oil Recovery (EOR)”.

#### 5. Report from CSLF Secretariat

Richard Lynch provided a four-part report from the Secretariat, which covered the status of PIRT Action Items from the March 2014 meeting in Seoul, the TRM Progress Report prepared by the Secretariat for the current meeting, outcomes from the March 2014 Technology Workshop that had been held in conjunction with the Seoul Technical Group Meeting, and an update on CSLF-recognized projects.

Mr. Lynch stated that there were six Action Items from the March 2014 meeting, all of which are now complete. A link to the GCCSI’s “[decarboni.se](http://decarboni.se)” website has been created on the “Publications/Links” page of the CSLF website. Four of other completed Actions were related to the TRM Progress Report.



**Richard Lynch**

Concerning the TRM Progress Report, Mr. Lynch stated that in the months following the Seoul meeting, the Secretariat developed a template (which was approved by the PIRT Chair) for gathering information about the technology needs areas identified in the 2013 TRM. The template was provided to Technical Group delegates, who then sent it to representatives of organizations within their countries which are working on CCS. As of September 29<sup>th</sup>, a total of 12 completed templates had been returned and these were used as inputs to the TRM Progress Report. There was judged not to be enough information yet to definitively describe the global status of CCS, but some trends were evident:

- For 1<sup>st</sup> generation technologies, none of the 10 technology needs areas were perceived as “fast moving” in terms of progress. Progress in most areas was perceived as a mixed opinion of “very slow” and “moderate”.
- Results for 2<sup>nd</sup> and 3<sup>rd</sup> generation technologies were similar, but many more “no opinion” responses were received.
- There appeared to be a geographical bias in responses so far received. North American responders were, in general, more pessimistic on the amount of progress being made.
- All types of barriers and/or drivers (economic, policy, and technology) were perceived to exist for most technology needs areas.
- Individual country results provided a wide range of responses, showing that issues surrounding CCS are viewed by different countries in different ways.

Mr. Lynch stated that one of the conclusions from this exercise was that the 2013 TRM is still reasonably accurate in its depiction and portrayal of the status and barriers/drivers for

development and deployment of CCS technologies. There is still a need for progress in all of the technology needs areas, some more than others. Further, results confirm that worldwide, CCS is not a “one size fits all” collection of technologies and there appears to be a great need for individualized country-specific technology roadmaps.

Concerning the March 2014 Technology Workshop, Mr. Lynch stated that the event consisted of two sessions: “Cost Reduction Strategies for CO<sub>2</sub> Capture” and “Examining Technology Pathways and Business Models for Scaling-up CCS”. It was a very well-attended event and there were many takeaways:

- Advances and innovation in the area of CO<sub>2</sub> capture are important and critical to the commercial deployment of CCS. The wide range of technology options under development is appropriate at this time.
- Technology scale-up is a critical step to cost reductions and technology validation, especially for 2<sup>nd</sup> and 3<sup>rd</sup> generation technologies. Simulations and modeling are important, but there is no substitute for experience and knowledge from real-world projects.
- Technological development and innovation must be rooted in clearly-defined targets and metrics. These will help drive sound RD&D investments.
- Understanding the overall CCS value chain is essential, with “market pull” mechanisms (e.g., policy incentives and drivers) being just as important as “technology push” efforts (e.g., grants and government cost share).
- Issues for governments to address include matching potential CO<sub>2</sub> sinks to CO<sub>2</sub> sources, adding infrastructure such as pipelines, and stimulation of skills development (which is as important as maturity of technologies).
- Issues for industry and project sponsors to address include reducing the risk of integration (which is a big contributor to the high cost of first-of-a-kind large-scale CCS demonstrations) and expeditiously bringing 2<sup>nd</sup> and 3<sup>rd</sup> generation technologies to pilot-scale testing.
- Issues for financial organizations to address include finding ways to reduce financial risk to equity holders and developing effective financial mechanisms for CCS demonstration projects.
- Above all, collaboration is essential for success.

Finally, concerning the portfolio of CSLF-recognized projects, Mr. Lynch stated that as of mid-September there were 43 active and completed projects, spread out over five continents. However, at the end of September, Italy announced that the Zero Emission Porto Tolle Project had been cancelled. Mr. Lynch concluded his presentation by reiterating that the Norcem CO<sub>2</sub> Capture Project was up for CSLF recognition at the current meeting.

## **6. Review and Approval of Project Proposed for CSLF-Recognition: Norcem CO<sub>2</sub> Capture Project**

Liv Bjerge, Project Manager for the Norcem CO<sub>2</sub> Capture Project, gave a presentation about the Norcem project. This project, located in southern



**Liv Bjerge**

Norway at a commercial cement production facility, is testing four different post-combustion CO<sub>2</sub> capture technologies at scales ranging from very small pilot to small pilot. Technologies being tested are a 1<sup>st</sup> generation amine-based solvent, a 3<sup>rd</sup> generation solid sorbent, 3<sup>rd</sup> generation gas separation membranes, and a 2<sup>nd</sup> generation regenerative calcium cycle, all using flue gas from the cement production facility. Objectives of the project are to determine the long-term attributes and performance of these technologies in a real-world industrial setting and to learn the suitability of such technologies for implementation in modern cement kiln systems. Important focus areas include CO<sub>2</sub> capture rates, energy consumption, impact of flue gas impurities, space requirements, and projected CO<sub>2</sub> capture costs. Project partners include Norcem, HeidelbergCement, and the European Cement Research Academy, and the project has also received funding from Norway's CLIMIT program. The project began in 2013 and is expected to continue into 2017.

Outcome: After a comprehensive discussion, there was consensus by the PIRT to recommend approval of the Norcem CO<sub>2</sub> Capture Project by the Technical Group.

## **7. Report on PIRT Activities concerning Knowledge-Sharing**

Dr. Foster stated that the GCCSI's "**decarboni.se**" website now has a page summarizing the work of the Technical Group's recently-concluded Task Force on Best Practices and Standards for Geologic Storage and Monitoring of CO<sub>2</sub>. The task force's report, downloadable from that page, includes sections on standards, guidelines, and best practice manuals. Lars Ingolf Eide, the Chair of the task force, complemented the GCCSI on its work to get this information online. Dr. Foster also thanked the GCCSI on behalf of the PIRT. The Secretariat was asked to create a link from the CSLF website to this report.

## **8. Update on the CSLF-recognized Gorgon CO<sub>2</sub> Injection Project**

Dr. Foster provided an update on the status of the Australia's Gorgon Project, which had received CSLF recognition at the 2010 Annual Meeting (also held in Warsaw). This project, when it comes online in 2016, will inject between 3.4 and 4.0 million tonnes of CO<sub>2</sub> per year into a water-bearing sandstone formation approximately two kilometers beneath Barrow Island, off the northwest coast of Australia. The CO<sub>2</sub> will be separated from natural gas being produced near that location. Over the life of the project, as much as 100 million tonnes of CO<sub>2</sub> could be injected. Dr. Foster mentioned that the project features an extensive monitoring plan, and using photographs provided by the project sponsors, showed the progress in site preparation and construction over the past four years including installation of the CO<sub>2</sub> compressor modules. The Gorgon Project will be the largest CO<sub>2</sub> capture and injection project globally and also the first project in Australia to inject CO<sub>2</sub>.

## **9. Future PIRT Activities**

Dr. Foster referred to the Secretariat's presentation on the TRM Progress Report from earlier in the meeting and reviewed the responsibilities of the PIRT Active Members for information analysis for each of ten needs areas. After ensuing discussion, the following breakdown was confirmed:

Area #1: CO<sub>2</sub> Capture Technologies in Power Generation (*Norway*)

Area #2: CO<sub>2</sub> Capture in Industrial Sector (*South Africa and United Kingdom*)

Area #3: CO<sub>2</sub> Transport (*Australia*)

Area #4: Large-Scale CO<sub>2</sub> 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*)

Area #8a: CO<sub>2</sub> Utilization, non-EOR (*France*)

Area #8b: CO<sub>2</sub> Utilization, EOR (*Saudi Arabia and Canada*)

Ryozo Tanaka noted that some of the information being requested, such as progress on 2<sup>nd</sup> and 3<sup>rd</sup> generation CO<sub>2</sub> transportation systems, may not even be relevant and the template should perhaps be modified to black out areas in the template where no information would be forthcoming. Philip Sharman noted that it was not clear on how this information would be used to produce a TRM Interim Report in time for the 2015 Ministerial Meeting. After an extended discussion on how to move the process forward, Mr. Lynch proposed the following:

- The Secretariat will make adjustments to the technology needs reporting template, after consulting with PIRT Active Members. (This would be completed by early December.)
- As was done previously, the Secretariat would then send the template to Technical Group delegates, who would then send it to representatives of organizations within their countries which are working on CCS. (Deadline TBD, but probably by early February.)
- The Secretariat would prepare a detailed and sortable spreadsheet containing all information received from the CCS experts, and would send the spreadsheet to the PIRT Active Members who are doing the data analysis, as shown above. (Deadline TBD, but probably by early March.)
- For each of the ten needs areas, the “owners” of those areas would examine the information in the spreadsheet (as pertaining to their areas) and would draft short progress reports that can be combined into a TRM Interim Report. (Deadline TBD, but probably by early May.)

There was agreement to use this approach.

## **10. Adjourn**

Dr. Foster encouraged CSLF delegations to become PIRT Active Members, if they have not already done so. Dr. Foster then thanked the attendees for their participation, noting the high level of interaction during the meeting, and adjourned the meeting.

### **Summary of Consensuses**

- The PIRT recommends approval by the Technical Group for the Norcem CO<sub>2</sub> Capture Project.

### **Summary of Action Items**

- The Secretariat will finalize the Summary for the March 2014 PIRT meeting including the two minor changes described above.
- The Secretariat will add a link from the CSLF website to the report from the Task Force on Best Practices and Standards for Geologic Storage and Monitoring of CO<sub>2</sub> at the GCCSI’s “**decarboni.se**” website.

- The Secretariat will make adjustments to the technology needs reporting template, after consulting with PIRT Active Members.
- The Secretariat will send the template to Technical Group delegates, who will facilitate the process in obtaining information from representatives of organizations in their countries which are actively working on various aspects of CCS.
- PIRT Active Members, as designated above, will take charge of information analysis for the technology needs areas, once information gathering is complete, and draft short progress reports for inclusion in a TRM Interim Report.