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POLICY GROUP

Status Report of the Task Force on Capacity Building in Emerging Economies

Note by the Secretariat

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Background

At the meeting of the Policy Group in Berlin, Germany, in September 2005, the Secretariat delivered a plan to assist emerging economy CSLF Members to develop the knowledge, skills and expertise they need to implement Carbon Capture and Storage projects and activities. At that time, creation of a Task Force was recommended that would be comprised of CSLF Members from both developed and emerging economies members and include delegates from the Policy and Technical Groups. This Task Force currently consists of the United States (lead), Australia, Canada, Colombia, France, India, Italy, Mexico, Saudi Arabia, South Africa, and the United Kingdom. This paper is a progress report of the Task Force's activities since the CSLF meeting in Paris, France, in March 2007.

Action Requested

The Policy Group is requested to review and consider the progress report of the Task Force on Capacity Building in Emerging Economies.

Conclusions

The Policy Group is invited to note in the Minutes of its next meeting that:

“The Policy Group reviewed and considered the progress report of the Task Force on Capacity Building in Emerging Economies.”



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STATUS REPORT OF THE TASK FORCE ON CAPACITY BUILDING IN EMERGING ECONOMIES

BACKGROUND

Capacity Building is critical to the development of Carbon Capture and Storage (CCS), especially in developing countries. Without adequate expertise and institutions, CCS simply will not happen. For that reason, the Carbon Sequestration Leadership Forum (CSLF) first started discussing capacity building at the Melbourne meeting in 2004. At the Berlin meeting in 2005 the CSLF authorized the capacity building program in the form of the Capacity Building for Emerging Economies Task Force (CBTF). The CBTF is chaired by the United States.

A review by the CSLF Secretariat of the needs for capacity building in emerging economies indicated that some of these nations already have many experts in relevant fields but that these experts need specific information and training in CCS. The CSLF has six emerging economy Members - Brazil, China, Colombia, India, Mexico, and South Africa - that would benefit directly from this proposed initiative.

Thus, the objectives of the Capacity Building Task Force took shape, keeping in mind the diversity of capability levels and the similarity of needs.

The expectation is that these objectives will accelerate the deployment of carbon capture and storage throughout the world through the broader dissemination of knowledge, the building of expertise and institutions in emerging economies, and the intellectual cross-fertilization that occurs through collaboration.

Objectives of Capacity Building Task Force

- Assist emerging economy Members to develop needed expertise and institutions.
- Develop a set of educational resources that all CSLF Members can utilize.
- Transfer lessons from CSLF Projects and other known CCS Initiatives.

Members of the CBTF

- Australia
- Canada
- Colombia
- European Commission
- France
- India
- Italy

- Mexico
- Saudi Arabia
- South Africa
- United Kingdom
- United States - Chair

Three workshops have been conducted under the guidance of the CBTF.

PITTSBURGH, UNITED STATES – THE FIRST WORKSHOP

In 2006, in Delhi, the United States offered to host the first Capacity Building Workshop for emerging economy members of the CSLF. Initially, the Workshop was scheduled to take place in Montana. However, the decision was made to hold the workshop in Pittsburgh to take advantage of the unique opportunity for the workshop participants to attend the Sixth Annual Conference on Carbon Capture & Storage which was to be held in Pittsburgh during the same week as the workshop. This is the premier international conference on Carbon Capture and Storage held in the United States. This provided the workshop participants the opportunity to hear the latest developments in CCS from world experts, as well as hear from individuals developing and managing actual projects around the world.

While the CBTF searched for funding from several sources, it became evident that more time would be needed to gather the resources. Not wanting to delay the workshop, the U.S. Department of Energy (DOE) made the commitment to fund all of the workshop logistics. DOE secured the in-kind contribution of professionals from the DOE's National Technology Laboratory (NETL) for the workshop organization. Finally, DOE made funding available for travel expenses for many delegates. It is noteworthy to point out that 11 of the 15 members of the Brazilian delegation were funded by Petrobras, thus allowing DOE funding to go to other delegations.

The Workshop was designed to:

- Give the participants an overview of basics of CCS
- To take advantage of the learning opportunities of the conference itself
- And, finally, to focus on the pragmatic issues related to CCS Project development

Invitations were sent by the CSLF Secretariat to the 6 nations targeted for this workshop: Brazil, Colombia, China, India, Mexico, and South Africa. The dates of the workshop were set to be during the week of July 7, 2007.

The syllabus for the workshop was developed with the thought of providing a somewhat basic, introductory overview of all pertinent CCS topics. The course syllabus was discussed at length with the Task Force members, and it was the result of a combined effort by leading international experts along with input from the participating countries.

The course syllabus consisted of:

- ◆ Overview of Issues and Need for Carbon Management
- ◆ CO₂ Storage Capacity and Assessment
- ◆ Risk Management
- ◆ Carbon Capture

- ◆ Measuring, Monitoring, and Verification
- ◆ Stakeholder Involvement
- ◆ Legal/Policy/Regulation in CCS
- ◆ Economics/Costs/Financing CCS Projects

The lecturers were renowned international experts in their respective fields. The 6th Conference provided the participants with technical, economical, and policy information that complemented what they learned during the workshop. At the request of some of the delegations a tour of NETL's R&D facilities was arranged. There, the wide array of current R&D work on CCS being conducted by NETL scientists was featured.

The following countries and entities were represented in the workshop:

- Brazil – 15 participants (Petrobras, Ministry of Science and Technology, Pontifical Catholic University, Santa Catarina Coal Producers Association, Ecoplan Institute)
- Colombia – 1 participant (Ministry of Mines and Energy)
- India – 15 participants (Ministry of Science and Technology, Central Electric Authority, Indian Institute of Petroleum, National Thermal Power Corporation, Oil India Limited, CDM Group)
- Mexico – 3 participants (Energy Secretariat, PEMEX, Mexican Institute of Petroleum)
- Republic of South Africa – 10 participants (Department of Minerals and Energy, Sasol, Anglocoal, Eskom, Council for GeoScience)
- Saudi Arabia – 4 participants (Ministry of Petroleum and Mineral Resources, Saudi Aramco, King Abdul Aziz City for Science and Technology.)
- One unofficial representative from China, sponsored by Australia, attended a portion of the Workshop

A post-workshop survey was conducted among the attendees to gauge the degree of usefulness, relevance, and technical merit.

The following results were obtained from the survey:

1. All participants who returned the completed questionnaire stated that the workshop met its intended objective and their needs.
2. Combining the CSLF workshop with the CCS conference was judged to have reinforced the workshop presentations and discussions.
3. The workshop speakers were rated as subject matter experts in their fields, with their performances as a speaker and their presentations rated almost unanimously as very good.
4. All of the workshop topics received positive ratings overall.
5. It was recommended that the CBTF consider:
 - developing a suite of basic, mid-level, and advanced CCS technology/policy/market workshops;
 - convening future workshops in emerging economies;
 - providing broader international perspectives via delivering Keynote Speeches and sessions devoted to emerging economy issues;
 - allowing more time for dialogue between presenters and participants;
 - visiting a pilot CCS demonstration site in conjunction with a future workshop, and;

- ensuring the broadest possible CCS information dissemination via CDs, websites, etc.

Further, the questionnaire as well as discussions that were held during the workshop question and answer periods and on its sidelines provided significant suggestions, some of which have been applied in the second and third workshops.

The Follow up Issues Discussed by Task Force following the First Workshop included:

- Compile Workshop developed materials as future educational resources.
- Explore opportunities for “in-country” (country-specific) capacity building.
- Brazil to host the next workshop in Porto Alegre in October 2007.
- Identify resources necessary for future capacity building activities.

PORTO ALEGRE, BRAZIL – SECOND WORKSHOP

The concept for the second workshop started during discussions between Brazil, the CBTF Chair, and the CSLF Secretariat at the Pittsburgh Workshop. There was additional planning and discussion with the pertinent parties on relevant topics at the IEA/CSLF/G8 meeting (Oslo, June 2007). Following that, the Brazilian organizers, the Pontifical Catholic University of Rio Grande do Sul (PUC) and the Brazilian sponsoring entity, Petrobras, maintained close contact with the CSLF Secretariat, the CBTF, and the U.S. DOE.

The Second CCS Capacity Building for Emerging Economies Workshop was held on October 18 and 19, 2007 in Porto Alegre. Petrobras sponsored the events and provided the funding for the international speakers. The Pontifical Catholic University of Rio Grande do Sul was the host.

The focus of this workshop was on a variety of specific technical aspects of CCS. The workshop consisted of two intense 8-hour days of lectures and discussions. Over 130 participants from 15 different Brazilian entities, including universities, oil and coal industry, and government participated in the workshop. Ten countries were represented between lecturers and participants.

The syllabus for this workshop consisted of technical lectures on various CCS issues, from capture to storage, including monitoring, legal and regulatory aspects, as follows:

- ◆ Capture and Geologic Storage of Carbon Dioxide – A Key Element of Climate Technology Portfolio
- ◆ Basin Electric Power Cooperative’s Approach to CO₂ Capture, Transport and Sequestration Technologies
- ◆ CO₂ Storage in Geological Media
- ◆ Measuring, Monitoring & Verification
- ◆ Legal and Regulatory Aspects of CCS
- ◆ CCS Safety and Analogues
- ◆ Sustainable Oil and Gas Production
- ◆ Storing CO₂ in Coal Seams
- ◆ CO₂ Storage in Saline Reservoirs
- ◆ Dynamic Mass Partitioning and Spatial Distribution of CO₂ Trapping Mechanisms

- ◆ CO₂ Well Integrity and Wellbore Monitoring
- ◆ Understanding Risks Associated with Deployment of Carbon Capture and Storage
- ◆ Source-Sink Matching and Country Assessment of CCS Potential

The intent was to raise the level of complexity of the topics presented from those presented at the first workshop in Pittsburgh. This, indeed, was accomplished. All lectures were conducted by international subject experts and the lectures were followed by question and answer periods that encouraged dialogue between attendees and lecturers.

This successful second workshop delivered a couple of important outputs, in addition to the outstanding educational opportunity. These outputs were:

- Development of the “*Student Body*” concept – a tool for exchange of information, rising of funds, etc. for students
- Concept of the Advanced Training Center for Emerging Economies within PUC’s Center for Excellence for Carbon Storage (CEPAC)
- Significant number of companies and students demonstrating interest in CCS issues

Building on the success of this workshop, Petrobras offered to host a similar capacity building workshop to be held in Salvador, Bahia, immediately preceding the Petrobras-organized Second International Seminar on Carbon Sequestration and Climate Change. The dates of the Second International Seminar are September 9 to 12, 2008.

AL KHOBAR, SAUDI ARABIA – THIRD WORKSHOP

The Third Workshop on Capacity Building on Carbon Capture and Storage for CSLF Members in Emerging Economies was held in, Saudi Arabia, January 27 to 30, 2008. The Saudi government hosted the meeting and workshop and Saudi Aramco sponsored the event, providing support for some of the lecturers’ travel expenses.

Seventeen countries were represented at the Al Khobar workshop which was offered within the framework of the CSLF Technical Group Business Meeting. Sixty participants and twenty one presenters took part in this third Capacity Building Workshop but there was a total flow of 130 participants during the workshop.

The workshop featured ample opportunities for panel discussion and interaction with the audience. The format was set so that the amount of time for presentations was limited thus allowing time for questions and answers. A moderator was responsible for keeping the dialogue flowing.

Of the four topics, the first one, dealing with Commercial Aspects and Opportunities, appeared to be of most interest. The workshop was more regional in its approach and topics discussed -thus the emphasis in oil and gas related issues as opposed to coal issues that had been highlighted in previous workshops.

The topic on Roadmaps was also well-received. The workshop was the venue where the Saudi representatives chose to unveil their own Technical Roadmap for CCS

The workshop also featured a visit to the Shaybah Field Gas-Oil Separation Plant where some of the sessions were held. Another highlight of the workshop was the participation of an

official from the Asian Development Bank who addressed issues of financing projects in emerging economies.

The excellent attendance along with the exceedingly high caliber of the presenters, the dynamic format, and the field trip proved this workshop a to be success.

The syllabus for the Saudi Arabia workshop featured a slightly different format, with the lectures centered on four themes:

1. Commercial Aspects and Opportunities for Storage of CO₂ in Oil and Gas Reservoirs
2. Technology Roadmaps and Their Importance
3. Issues that Impact CCS
4. The Needs of Emerging Economy Countries

The decision was made by the organizers along with the CSLF Secretariat and the CBTF to focus on few selected topics after initial workshops in Pittsburgh and Porto Alegre covered a wide range of CCS topics. Participants in previous workshops had strongly suggested that attention be devoted to the topics that became the third workshop themes.

The initial plan for the workshops, prior to Pittsburgh, had been to provide the participants with a tutorial that would cover all aspects of Carbon Capture and Sequestration. It was understood that the level of expertise among the emerging economy member countries was diverse but the decision was made to have a starting point. The workshop in Porto Alegre increased the complexity of the topics. The workshop in Al Khobar, on the other hand, provided a focus and increased the depth of selected topics.

Following the established premise that lessons learned from the workshops would be used to improve the forthcoming workshops, several “Themes” were decided upon based on suggestions by previous workshop participants, the hosts, the CBTF, and the CSLF Secretariat.

The syllabus for the third workshop was as follows:

Theme I: Commercial Aspects & Opportunities for Storage of CO₂ in Oil and Gas Reservoirs

- ◆ CO₂-EOR Operations: The IEA GHG Weyburn-Midale CO₂ Monitoring and Storage Project
- ◆ CO₂-EOR Research in Saudi Aramco
- ◆ Potential for CO₂ Sequestration from Natural Gas Production
- ◆ Economics of CCS for EOR

Theme II: Technology Roadmaps and Their Importance

- ◆ Saudi Aramco’s CO₂ Carbon Capture & Storage Technology Roadmap
- ◆ Australia’s Carbon Dioxide Capture & Storage Technology Roadmap
- ◆ Canada’s CO₂ Capture and Storage Technology Roadmap
- ◆ United States Carbon Sequestration Technology Roadmap & Program Plan / FutureGen
- ◆ The European Union’s ZEP Platform

Theme III: Issues that Impact CCS

- ◆ Issues that Impact CCS
- ◆ Legal and Regulatory Issues
- ◆ Risk Assessment
- ◆ Societal Issues related to CCS Deployment
- ◆ Public Outreach and Education

Theme IV: The Needs of Emerging Economy Countries

- ◆ Needs of Emerging Economy Countries
Ashok Bhargava, Asian Development Bank
- ◆ The Needs of Emerging Economy Countries - Brazil
Marcelo Ketzer, PUCRS-CEPAC Carbon Research Center, Brazil
- ◆ Needs of Emerging Economies - India
Sanjay Sharma, Central Electricity Authority, New Delhi, India
- ◆ Challenges of CCS Deployment - South Africa
Jeff Kogbane, Department of Minerals and Energy, South Africa

ADDITIONAL EFFORTS OF THE CAPACITY BUILDING TASK FORCE

The Chair of the Task Force, with the input of task force members, has developed a 2-year plan to complement the original task implementation report prepared in August 2005. The Chair of the Task Force, presented the 2-year plan for this Task Force to the members during the meeting held in Calgary, Canada in November, 2007. The plan was discussed at the meeting and comments on the plan have been submitted to the Task Force Chair. The plan is nearly finalized.

The CBTF has discussed holding capacity building workshops over the next 2 years in the following countries: China, Colombia, India, Mexico, and South Africa.

In addition, the Task Force has received requests from several emerging economy CSLF nations for more in-depth training and visits to CCS-related R&D facilities and CCS demonstration sites.

The Task Force's near-term efforts intend to focus on the continued development and standardization of workshop presentation and training materials containing the most current CCS information. This will be accomplished by building upon the completed U.S., Brazil, and Saudi Arabia workshops, while taking into account ongoing and planned CCS projects, R&D, training, and conferences and workshops around the world. The materials from all workshops have been posted in the CSLF website.

Another near-term priority, which was identified in the Brazil workshop, is to develop a CCS training module aimed at the governmental and private sector decision makers in energy sectors of emerging economy CSLF member countries.

Financing the workshops continues to be an issue of concern and the Task Force members continue to work on determining options and available opportunities.

Following is the complete list of workshops confirmed or proposed:

- Mexico, July 2008 - proposed
- Brazil, September 2008 - confirmed
- U.S.A., November 2008 - confirmed
- India, January 2009 - proposed
- China, second quarter 2009 - proposed
- Colombia, second half 2009 – proposed
- South Africa, TBD

Currently, Task Force seeks the following:

- Conduct a quick and comprehensive survey of the CCS activities of governments, multilateral organizations, academia, NGOs, and the private sector for potential for collaboration, cooperation and leveraging of their ongoing and planned CCS capacity-building activities.
- Agree with potential partners on the most synergistic, high-payoff opportunities for joint capacity building activities.

The next meeting of the Capacity Building Task Force will take place in Cape Town, South Africa, on Sunday April 13, 2008.

CONCLUSIONS

With regards to actual capacity building workshops, the CBTF can state that the objective has been met. Over 300 scientists, engineers, and other professionals from several countries have participated and are now in possession of substantial CCS knowledge. A collateral benefit has been the networking opportunities that these workshops have afforded to the participants. These can only lead to various levels of collaboration that, in the end, benefit everybody.

The financing of the workshops is of concern. For the first three workshops, the United States, Brazil, and Saudi Arabia have assumed most of the costs associated with conducting the workshops in their respective countries, including planning, hosting, and some travel costs. These costs are not insignificant (i.e., tens to hundreds of thousands of U.S. dollars.)

The CSLF itself has no resources, but is supported through in-kind efforts and resources committed by its individual members on an ad hoc basis. It is the hope of the Task Force that accomplishment of all future capacity building activities can be grounded in the premise of CSLF member countries commitment to support Task Force activities in and with the emerging economy CSLF member countries.