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# CCOP CO<sub>2</sub> Storage Mapping Program (CCS-M)

## Seminar 2 (S2): CCS and EOR

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### Summary Report

Hanoi, Vietnam - 18-20 March 2014

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Participants of **CCS-M** S2 visiting the “outdoor geological museum” of Trang An - Ninh Binh, Vietnam.



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**CCS-M S2** is the second Seminar conducted by the CCOP Technical Secretariat (TS) in cooperation with the Global CCS Institute (GCCSI), Norwegian Ministry of Foreign Affairs, PETRAD and Vietnamese Institutions – PetroVietnam (PVN), Vietnam Petroleum Institute (VPI) and Vietnam Institute of Geoscience and Mineral Resources (VIGMR). The objectives are to enhance the knowledge of the member countries on methodologies in assessing geological storage of CO<sub>2</sub>, the storage capacity and CO<sub>2</sub> for EOR technologies.



The Seminar is also one of the technical activities conducted in Hanoi to coincide with the visit of the Crown Prince of Norway and his family to Vietnam in March 2014. The resource persons were from Norwegian Petroleum Directorate, PETRAD, Tel-Tek AS (Norway), DNV GL, CSIRO and ANLECRD (Australia), Belgium, and Japan. A total of 67 participants from CCOP Member Countries (China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam) participated in S2. The total includes 53 local participants and 3 from the CCOP Technical Secretariat.

Present during the opening ceremonies were the management representatives from PVN, VPI, VIGMR as well as Dr Oystein Berg, special adviser of PETRAD, Norway. Dr. Nguyen Dac Dong, Director-General of Department of Science and Technology, Ministry of Natural Resources and Environment (Vietnam), in his opening speech emphasized the





importance of geological storage of CO<sub>2</sub> and the use of CO<sub>2</sub> for EOR technologies in Vietnam both as a climate change mitigation strategy and for the development of high CO<sub>2</sub> gas fields. His key message is that cooperation among Vietnamese institutions and with international organizations, such as CCOP and PETRAD, will be necessary to deliver the required expertise.

The keynote address of Dr. Ho Huu Hieu (VIGMR) provided an overview of CCS studies in Vietnam that started in 2009 by a joint-study with BGRM (France), entitled “Where is the capacity of CO<sub>2</sub> storage in Vietnam” and with Japan in the Project “Studying the ability of using CO<sub>2</sub> for EOR in offshore oil fields in Vietnam to partly respond with climate change”. Initial results from these studies identified 2 potential sedimentary basins for CCS - Red River Delta Basin and An Chau Basin.

The S2 agenda basically focused on the complex CO<sub>2</sub> storage, its attributes and the classification for resource storage estimates. The presentations were supported with case studies from Norway - Sleipner, In Salah and Snohvit Fields and Canada-USA – Weyburn and Midale CO<sub>2</sub> for EOR fields. The key learning from these presentations were as follows:

1. All CO<sub>2</sub> geological sites are unique, but there are many workflows available to assist with a systematic appraisal of storage potential. Basin resource management is an important consideration in ranking potential storage sites



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2. The critical subsurface factors are related to injectivity, capacity and containment. Static capacity estimations are useful for early regional screening, but must use efficiency factors.
  3. For the operational storage capacity, it is important to understand the degree of communication between the different sandy formations within the aquifer. In a basin where oil and gas production has been going on for sometime, the main risk for leakage/seepage is the integrity of existing exploration and production wells.
  4. The CO<sub>2</sub> EOR is a mature technology and has been practice for ~40 years - demonstrated to be safe for large-scale injection and CO<sub>2</sub> storage.
  5. A shown in the Weyburn – Midale CO<sub>2</sub> for EOR operations, CO<sub>2</sub> for EOR can provide a business case for injection and associated storage of CO<sub>2</sub>. One of the barriers is the lack of readily available, high quality CO<sub>2</sub>.
  6. There is a lot to learn in building a geological CO<sub>2</sub> storage atlas. Establish a group of geologists, reservoir engineers and mapping specialists (GIS). Set up a good plan and works towards a fixed/agreed deadline but allow some time to creativity. Build up a network with universities, oil/mining industry, research and other relevant institutions (local & international), and make an effort to obtain as much as data and maps as possible at an early stage of the project.

Going forward and based on the general feedback from the participants, the next Training Course (T4) that will be hosted by Malaysia (PETRONAS) in May 2014 include agenda items on workshops/exercises for the deeper understanding of the characterization of storage reservoir and estimation of capacities. This will be done with more hands-on exercises and assessment of the criteria parameters using real data from the case study led by experts from various CCOP networks.



*The organizers and resource persons*

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Prior to S2, the national coordinators from CCOP member countries together with the CCS-M Coordinator and Petrad had their first coordinators' meeting (NC1) that was hosted by PVN at their main headquarters in Hanoi. The meeting achieved its purpose of updating the national coordinators of the latest development and plans of CCS-M in 2014, the case study areas and specific technical needs of the countries hosting the case studies.

A 1-day field trip was organized by VIGMAR to Trang An – Ninh Binh karst which is also considered as the “Ha Long” on land.