
CCOP CO₂ Storage Mapping Program (CCS-M)

Seminar/Workshop on CO₂ Geological Storage and CO₂ for EOR (coded S6)

VPI Center, Hanoi, Vietnam

7-9 June 2016



Introduction

Carbon Dioxide Capture, Use and Storage (CCS) research and development are also reflected in the level of economic development of each member country of CCOP. CCS-related research activities in Japan, China and Korea are on-going activities of their geological surveys and national research institutes. These countries have also gained a lot of knowledge in CCS, particularly the geological CO₂ storage aspects. Indonesia, Philippines, Thailand and Vietnam were beneficiaries of the ADB-funded Project, “Exploring the potential for CCS in SE Asia”, that was completed in late 2011 and resulted to an enhanced level of knowledge about CCS, particularly on geological storage aspect. Malaysia is about the same level as the 4 (four) mentioned countries while the rest of the CCOP member countries can be described as still in the infancy stage of CCS knowledge development.

CCS-M is designed to support existing CO₂ geological storage research activities as well as kick start the implementation of geological storage mapping in other member countries.



Objectives of CCS-M S6

The recent COP21, also known as the 2015 Paris Climate Conference resulted in the first agreement requiring all nations (rich and poor) to pledge action on climate change, with the aim of restricting global warming to “well below 2 deg C above pre-industrial levels”, and to strive to limit it to 1.5 deg C. Carbon dioxide (CO₂) capture, use and storage technologies (CCS) will have to play an important role to achieve the climate targets of COP21.

In order to fully understand the emission reduction potential, decision makers need to understand the amount of carbon dioxide that can be safely stored in the subsurface and the geographical distribution of storage resources that are available. Estimates of storage resources need to be made using reliable and consistent methods. A deeper understanding on the technologies that are now available for the use of CO₂, such as EOR, is also in the S6 agenda. The CCS-M Seminar/Workshop S6 aims to enhance the knowledge of the member countries on methodologies in assessing geological storage of

CO₂, its storage potential and CO₂-EOR technologies. The challenges and gaps in the implementation of CCS will again be looked into.

Participants

30 participants from Cambodia, Indonesia, Japan, Korea, Lao-PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam. The number also includes the observers from Taiwan, resource persons from Australia, Norway, Indonesia and Taiwan, and CCOP Technical Secretariat.

The distinguished guests at the opening ceremonies were as follows:

1. Prof Dr Tran Tan Van - Director General, Vietnam Institute of Geology and Mineral Resources (VIGMR), MONRE
2. Dr. Nguyen Hong Minh - Deputy Director General, Vietnam Petroleum Institute
3. Dr. Trinh Hai Son - Vice-Director, VIGMR
4. Dr Christopher Consoli, Senior Adviser, Global CCS Institute (Australia)
5. Mr Simplicio Caluyong - Project Coordinator, CCOP Technical Secretariat (Thailand)

The 1st keynote address by Dr Ho Huu Hieu of VIGMR, provided insights into the future of CCS in Vietnam with the Red River Delta Basin as one of the potential area for its first pilot or demonstration project. The said basin is home to Vietnam's first production gas wells that is now close to its depletions. It is also proximate to the planned Coal-to-power plant that will provide the main source of CO₂ for the injection pilot.

The 2nd keynote address by Dr Chris Consoli of the Global CCS Institute highlighted once again the importance of CCS as one of the critical technology to mitigate the impact of climate change. The presentation also emphasized that we can not hope to tackle the scale of the climate change challenge without CCS and there are substantial geologic storage present in key regions of the world sufficient to enable CCS. One concern is that while China has ramped implementing large-scale projects, Europe has looked the other way. He ended his keynote with a message that "strong leadership is needed by decision-makers in government and industry to realize the full potential of CCS."



Country Presentations

1. **Indonesia** (LEMIGAS & ITB reports) - In its INDC at COP21, Indonesia committed 29% and up to 41% with international support by 2030. CCUS research projects are on-going with the South Sumatra basin area due to its proximity to CO₂ sources. The Gundhi CO₂ Storage Pilot Project (Java) will start the CO₂ injection in early 2017. The learnings from Gundhi will be very beneficial to the development of high CO₂ fields in Indonesia, like the Natuna D-Alpha field that has an estimated total gas in place of >200 tcf of which 71% is CO₂. The rest of the CCOP members are also following the development of Gundhi pilot earnestly as this will be the first CO₂ injection pilot in the region. A CCS Centre of Excellence is recently set-up to capture the best practices and facilitate the dissemination of knowledge in CCS to government agencies, universities and industry.
2. **Japan** (GSJ)- Japan aims to reduce emission by 20% by 2020 (2005 baseline). After the completion of the Nagaoka CO₂ injection pilot project (2008) by RITE, Japan is now focusing on a large scale demonstration project (currently on development) at the Tomakomai site. CO₂ injection at the Tomakomai site is planned to start this year at 100,000 tpa. This government project will be taken over by the Industry around year 2020. Among the expected outcomes from the CCS demo projects are the development of new and efficient technologies to benefit future CCS projects.
3. **Korea** (KIGAM)- The CO₂-EOR pilot project (2012-2015) at the Meruap Oil field, Sumatra, Indonesia was aimed to develop the integrated technology of CO₂ storage



and CO₂- EOR through the injection of 1000 ton CO₂. The pilot was considered by KIGAM a success and together with its partners, is pursuing for the second stage of CO₂-EOR project.

4. **Malaysia** (PETRONAS) - At COP21, Malaysia committed to 45% reduction by 2030 (baseline 2005). Assessment of potential storage sites (level 1) have been conducted and documented in their Storage Atlas. These includes the high CO₂ fields and

preliminary geologic storage capacity of Sarawak basin that is estimated currently at 37 tcf.

5. **Myanmar** (MOGE) - MOGE has conducted a screening of all its sedimentary basins using the CCS-M Guideline and identified preliminary sites as candidates for geologic CO₂ storage. The depleted gas fields at Payagon will be studied by MOGE in detail and the results will be shared to CCOP.
6. **Philippines** (DOE)- The country's INDC commits to reduce emissions by 70% by 2030 by focusing on energy efficiency program and use of renewable energy. Currently, there are no CCS-related projects implemented but the geologic storage potential is estimated at 0.3 Gt (effective capacity) for oil and gas fields and theoretical capacity of 22.7 Gt for saline aquifers.
7. **Thailand** (DMF) - At COP21, Thailand pledged to reduce emission by 20% (up to 25% with international support) by 2030. However, CCS is not among the mitigation technology considered at the moment due to its prohibitive cost. The capacity of geologic storage of Thai basins has been studied and evaluated with total theoretical capacity of 1.9 Bt.

Both Cambodia and Lao-PDR are still in the process of evaluating the potential of their basins based in available data.

CO₂ storage and EOR Technology presentations

1. **Australia** (CSIRO) - The CCS Flagship Program, a joint undertaking by the Federal, State and Industry, was implemented in 2009-2010 with a budget of AUD1.7 Billion. The Otway Demonstration Project, one of the flagship, has been a valuable source of knowledge on CCS not only in Australia but for the whole world. Another flagship, The Gorgon CO₂ Injection Project will soon start its operation (2017?) with a planned injection of 4 MTPA. Two (2) other CCS Projects are in characterization phase (CarbonNet - Gippsland Basin and Wandoan-CTSCo - Queensland).
2. **Norway** (NPD) - The development of CO₂ Storage Atlas in the Norwegian Continental Shelf was presented including the workflow, assessment of data that was used and the methodology - comparing deterministic vs probabilistic. Norway has 20 years experience with safe CO₂ storage highlighted by the Sleipner field (Utsira) and recently, the Snohvit field. The government further plans to invest on a broad front to develop cost-effective technology for CCS and seek to construct at least one full-scale a capture (& storage) demonstration plant by 2020.
3. **Taiwan** (observer) - Taiwan shared the CCS activities that focused on assessment of storage sites and the Taiwan power (TPC) CCS project. The TPC CCS project estimated the theoretical capacity of depleted oil and gas field at 2.8 Bt and for saline acquire 45.6 Bt. The M-1 well was drilled in 2013 to a depth of 3000m with continuous

coring from 1500 - 3000m. This well revealed that good reservoirs area available with intra-formational seal. Pilot injection will be soon be deployed once the CO2 regulatory framework in Taiwan is ready.

The draft specifications for the application of **UNFC - 2009** to Injection Projects was also presented, borrowing the presentation materials from the 7th Session of the Expert Group on Resource Classification at UNECE, Geneva last April 2016.

Summary and the Way Forward

CCS had a high profile at COP21 as a mitigation option. The various agencies represented in the CCS-M events are encouraged to continue promoting and communicating CCS to be included in their INDC and to actively participate in the discussions to ensure CCS Technology is discussed and considered at the national level. The CCOP Storage Atlas draft will be first published within this year and all participating countries are encouraged to submit their basin maps with the estimated geologic storage capacities, as mentioned in the Country Reports

A 1-day field trip was organised by VIGMR to Tien Hai - Thai Binh to visit the Gas Processing Plant and site of future CO2 Injection Pilot Project. A side trip to the Keo Pagoda (Tran Dynasty) was also made on our return trip to Hanoi.

