



ENOS

Enabling Onshore CO₂ Storage



**A CO₂GeoNet
Initiative**

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**Experience Sharing Focus Groups: Minutes of the 1st
workshop
“Framing the topics”**

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1 Executive summary

This short report is synthesizing the discussions from the first Experience Sharing Focus Group workshop. The goal of this workshop was to brainstorm and to plan future topics to be presented during webinars or workshops. The following table presents the main conclusions of this workshop.

Event	Tentative date	Topic	Comments / persons to contact
1 st webinar	09/2017	Data archiving / management on a site by site basis(GFZ)	GFZ, BGS, KGS
2 nd webinar	01/2018	“Smart” drilling – reduction of costs	Longyearbyen, CIUDEN, IRIS, KGS
2 nd workshop	05/2018	Managing leakage for protection of the environment and groundwater.	ENOS WP3 +?
3 rd webinar	11/2018	CO2 supply and source	CO2 business (air liquid), CO2-EOR sites
4 th webinar	03/2019	Communication / engagement with local population	WP5 and WP8 of ENOS. GCCSI is particularly interested in this topic
5 th webinar	06/2019	Quick analysis of data as they come (incl. joint analysis of T&P)	Battelle, KGS, IRIS (Otway)
6 th webinar	11/2019	To be determined	
7 th webinar	02/2020	Relationship with decision makers	WP7 of ENOS + outside
3 rd workshop	05/2020	Monitoring / Site characterisation / comparison with models	ENOS partners, Otway (CO2CRC), Battelle

2 Introduction

This report is a synthesis of the first experience sharing focus group (ESFG) workshop held in Venice, as part of the 12th OpenForum organised by CO2GeoNet, in May 2017. Experience sharing focus groups are part of Task 6.1 (international cooperation) of the H2020 ENOS project. The goal of these groups is to share experience and recommendations around specific topics with the global goal of facilitating future onshore pilots of CO₂ storage.

The ESFGs are open to all researchers and pilot sites around the world. The tackled topics are different from research priorities, as they can also be more practical issues: the goal is to remove any hurdles to running a successful pilot site.

Seven webinars and three workshops are planned in total as part of the ENOS project. The purpose of this first workshop was to discuss the topics that may be of interest to the ESFGs, to prioritize them, and to start to plan the next webinars.

This workshop was open to all participants of the OpenForum and researchers from outside ENOS actively participated in the discussions, which was essential for opening the horizons of discussions.

In the following paragraph, the main topics discussed are listed, and then the tentative schedule is shown.

3 In what areas could developing European onshore pilots learn from international experience?

Here is a list of the discussed topics. At this stage, no effort was made to prioritize these items. The inclusion in this list does not warrant the topic will be treated in a webinar or workshop. Some details were collected during the workshop so may not fully represent what was being said or may seem a little chaotic. A remark was made during the workshop that new topics and new interests needed to be re-evaluated during the project. The annual ENOS meeting is a good opportunity to do this.

- **Hydraulic characterization of fractured media with low matrix permeability (proposed by CIUDEN)**
 - o The challenge at the Hontomin reservoir, a deep saline aquifer comprised of fractured carbonates with low matrix porosity, was to manage the low injectivity in the early stage of hydraulic characterization
 - o Why is it important? To determine the injectivity range (pressure temperature and flow) in these “tight” formations according to efficiency criteria and ensuring the long term integrity of the cap-rock
 - o Challenge – gaps: to conduct injection tests under reservoir conditions in laboratory scale which permit the performance of field tests to increase the reservoir permeability in safe conditions / data consistency assessment for the long term injection, analysing borehole effects or reservoir effects
- **CO₂ supply, on-site handling and injection strategies (proposed by CGS)**
 - o Description: Best CO₂ source and transport? How to store it on-site before injection? And what are the best strategies for injection (e.g. avoiding pressure waves, compression, heating or cooling, etc.) For site in pre-injection phase.
 - o Why is it important: this is a critical part of any plan of a new storage pilot, and experience of those who are already injecting is priceless
 - o Main challenges / gaps: how to organize things cost-effectively, efficiently and avoid unnecessary mistakes
- **Temperature and Pressure data and their use (proposed by Battelle)**
 - o From experience, these measurements are generally not used in analysis, especially on-site, whereas there is a lot of experience from e.g. O&G: they can know on-site if everything works according to plan or not.
 - o The data needs to be analysed as it is collected
 - o The question may not be fully resolved for more mature industries
 - o The data frequency is not related to the information
 - o E.g well tests
 - o Were there any optimization study?
 - o Not enough data or too much of it. Need to take account of differences or similarities.
- **Database / context library of pilots (proposed by Battelle)**
 - o Build a database with relevant data so researchers can find the best analogue for their application
 - o Test efficacy of monitoring techniques
 - o Reservoir conditions, injection conditions, monitoring techniques
 - o IRIS: experience in expertise for IOR
- **Data archiving or management on a site by site basis (proposed by GFZ)**
 - o Ketzin: Several persons were handling the data. You need all meta-data so that other researchers can work on the same set
 - o Sometimes difficult to reconstruct. People collecting the data vs analysing the data. Important that all corrections are traceable

- As an example, in Australia they published a report collecting and presenting data from all sectors of energy, including CCS.
- Need to discuss standardization
- E.g. collection of data in WP9 of ENOS by UK CCS
- Would be useful to construct a database that people can use
- **Purpose of pilots (proposed by BGS)**
 - One reason is research. Also building confidence. Test storage formations prior to larger scale deployment
 - Why people do that?
- **Communication with local population (proposed by BRGM)**
 - Which data will be public? How to communicate? Tool for visualisation? How different sites tackle this issue.
 - E.g. Ketzin in schools with hands on experiments. Toolkit available. Local newspaper first.
 - See also work being performed in ENOS
 - How the size influence public opinion?
- **Engagement with local population (proposed by GCCSI)**
 - E.g. Peterhead project. Boundary dam. Ex in China
 - Public reacts differently to gas storage than CCS, and CCUS. Need to revisit the framing of CCS/CCUS and compare to previous storage. We are not taking advantage of existing facilities that have gained acceptance
- **Site characterization / design**
 - Evaluation of measurement / preparation of site / understanding geology
 - Interaction between different types of measurements. Sitting characteristics
 - Sulcis: the “problem” is the support from government, permitting / local authority support
- **Smart / cheaper drilling (proposed by CGS)**
 - E.g. in Longyearben. Used non conventional drilling
- **Cost reduction (Proposed by BRGM)**
 - This is the main topic in capture, how can we do it in storage?
- **Capture and storage communities talking to each other (proposed by IRIS)**
 - Experience from Vattenfall / Ketzin but constraints from politics and finance
 - Especially important for post-pilot stage
 - Discussions with other EU project
- **Modelling and simulation. Verification of results**
 - Comparing the initial results to the actual outcome
 - A pilot site should behave as anticipated
 - Related to the CCS directive
- **Business models**
 - Relation with China, emerging countries
 - Priority of H2020, make deeper dissemination in China
 - Generate enough funding
 - Technical proven and sellable / marketable
 - Valorisation and education
- **Monitoring**
 - Of common interest for many pilot projects
 - E.g. how to arrange the micro seismic monitoring in noisy environment. Set up the array
 - To determine an efficient monitoring with respect to the objective. Different to track leakage than reservoir
 - Long term monitoring: how long? Who pays? Track CO₂ in the longer term. Fate of the CO₂.
 - Regulatory point-of-view. Requirements

- Minimum amount required.
- **Regulatory issues in all the value chain**
- **Site readiness**
 - Cf. Speech by Owain Tucker (on Storage Resources Management System, SRMS): how much data for readiness. Compare TRL (Technology readiness level) to site readiness.
 - Compare the SRMS as applied to various sites.

4 Planning the experience sharing focus groups: what topics should be tackled in priority and how?

During the second session of the workshop, the participants looked back at the proposed topics and tried to prioritize them and to plan them on the remaining ENOS timeline (i.e. from fall 2017 to fall 2020).

Several criteria were considered:

- Potential reach (i.e. the topics should be interesting to a lot of scientists and project managers)
- Possible contributions (are there enough potential speakers that can make an interesting talk on the subject?)
- Contributions from ENOS (the results of the projects will be more important towards the end)

Considering this, the topic that the attendance agreed should be treated at the **first webinar** was the topic on data management proposed initially by GFZ. Potential volunteers were GFZ, BGS and KGS (Kansas Geological Survey)

Most people found the topic “regulatory issue in all the value chain” interesting, but agreed that it needed to be formulated as a challenge and that it should be interesting worldwide (not just focused on the EU directive for instance). The issue is generally the interaction with authorities, often under regulatory regime that are not fitted for pilots. Problems include lack of understanding from regulators or lack of support / interest. The topic should thus be “Relationship with decision makers” and attendees agreed it should more be **tackled toward the end of the project**, in relationship with WP7 of ENOS

The third topic was “Smart / cheaper drilling”. The interest here lies in the potential for cost reduction, so the topic was merged with the one on cost reduction. This topic covers drilling, logging, completion, tool installation, and later “services” of the well (integration vs separation). Potential speakers: Longyearbyen as they used non-conventional drilling (need to be contacted first); CIUDEN at Hontomin, IRIS and KGS. This can be the topic of the **second webinar**.

The topic initially proposed by CGS about CO₂ supply turned into a discussion about CO₂ sources. The fact is that most pilots just buy food grade CO₂ for injection and probably capture pilots just vent the captured CO₂ in the atmosphere. Only the Lacq pilot by Total was integrated. The subject of mobile capture and mobile producer unit was then raised, and people observed that there are probably many plants across Europe producing CO₂ streams of high quality that is just vented. Matching sources and storage sites raises the question of transboundary issues. People to contact include people in the CO₂ business, or CO₂-EOR site owners (e.g. in Hungary or Croatia).

WP3 on ENOS on “managing leakage for protection of the environment and groundwater” is planning a **workshop** on their activities at the 2018 OpenForum. This workshop can be a part of the ESFGs.

The topic of monitoring was seen as very important and it was thus decided that **the last workshop** should be dedicated to that topic. Other topics in relation to this should also be discussed at this workshop: site characterisation, including hydraulic characterization, comparison between observations and models

While discussing the various topics revolving around the theme of monitoring, a specific topic emerged for a **webinar**: quick analysis of data as they come (including joint analysis of temperature and pressure data).

The topics of a database of pilots and purpose of pilots were considered as not adapted to webinars and should instead be treated as an offline activity.

Similarly, the topic on capture and storage communities talking to each other should probably be treated outside of the ESFGs, maybe at the next OpenForum. Business models were also seen as inappropriate for ESFGs, but is an important topic that is tackled in WP4 of ENOS.

5 Planning the ESFGs

Here is the synthesis of the discussions and the preliminary plan for ESFGs.

Table 1: Synthesis of the discussions – preliminary planning of ESFGs

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