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Project Title

Establishing a Research Observatory to unlock European Coal seams for Carbon dioxide Storage

ROCCS

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Deliverable D1.4

First workshop (site design, development, and operation)

WP1 Project management, dissemination and reporting

Lead Beneficiary
Cardiff University (CU)
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Dr Marian Wiatowski |
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**Dissemination level:**

- **PU** = Public
- **PP** = Distribution restricted to other programme participants
- **RE** = Distribution restricted to a group specified by the consortium
- **CO** = Confidential, only allowed for members of the consortium
EXECUTIVE SUMMARY

The report consists of 4 chapters presenting a course of the workshop organised in frame of the ROCCS project.

The first workshop was devoted to the design, development and operation of the ROCCS in-situ test. The workshop provided a forum for in-depth discussion of the project development and outcomes.
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1. Welcome and introduction

Due to CODIV-19 pandemic, the workshop was limited to an online meeting. The participants from the consortium as well as external members had been invited to join the workshop. The workshop agenda was presented, which included plan of the workshop and the list of attendees.

2. Presentation on site design, development, and operation

2.1. General presentation on project progress and planned actions

Firstly, dr Kamil Stańczyk presented the recent progress of the ROCCS project – mainly the detailed characterisation of the selected for in-situ experiment mining area. It consisted of documentation analysis, CO₂ background emission monitoring, and coal samples collection and laboratory analysis. It was followed by results of small-scale CO₂ adsorption-desorption cycles analysis using the acquired coal samples.

The main part of the presentation was about the planned experiment of in-situ CO₂ injection. The diagram of the injection setup was presented, together with location and planned sequence of drilling works. It was estimated that it will be possible to drill about 120 meters of horizontal well, with 75 meters of bore hole for CO₂ injection purpose, as well as 4 vertical monitoring wells. The horizontal well would be drilled in stages in order to assess the correlation between well length and total amount of CO₂ injected.

2.2. Presentation on details of CO₂ injection system

The presentation focused on the CO₂ injection system. Dr Wiatowski explained how the system is going to work, possible modes of operation and measuring range.

2.3. Presentation on details of Experimental Mine Barbara underground conditions

Dr Hildebrandt delved more into the technical aspects of Experimental Mine Barbara underground conditions. The operation of underground CO₂ and CH₄ monitoring system was presented. Then the planned adaptation of the existing infrastructure and how the drilling works will be carried out was discussed.

3. Discussion

After concluding the presentations, all the participants were invited to join the discussion. Most importantly, the placement of vertical monitoring wells in relation to the horizontal injection well was discussed. In order to acquire relevant data the wells should be placed neither too close nor too far away. Based on the modelling results it was concluded that the first and the second wells should be placed about 3 m and 6 m from the horizontal well, respectively. In addition, assuming that the coal seam is more or less homogenous and only slightly inclined, the wells should be drilled on the opposite sides of the well for better results averaging.

Another matter to discuss was whether or not the CO₂ flow into the well has to be maintained at all times during the experiment. It was decided that as long as the monitoring of CO₂ and other vital for the process parameters are constantly monitoring, the flow of CO₂ can be temporarily suspended if there is such need without negative effect on the results.
4. Outcomes

The workshop provided an update on the project progress to both consortium and external members who decided to participate. Based on current status of project development, a discussion about details of planned actions was carried out. The debate focused on planned in-situ CO$_2$ injection experiment as it is considered a core milestone of the project. The discussion resulted in the development of a detailed research plan including: CO$_2$ injection strategy (e.g. estimated injection pressure), placement of the monitoring wells, process division into two stages with specified injection well lengths.

5. Appendices

The appendices constitute of:

- Workshop Agenda
- General presentation on project progress and planned actions
- Presentation on details of CO$_2$ injection system
- Presentation on details of Experimental Mine Barbara underground conditions
"Establishing a Research Observatory to unlock European Coal seams for Carbon dioxide Storage (ROCCS)"

First Workshop (site design, development, and operation)

Instalation for measuring CO₂ sorption

Marian Wiatowski

Central Mining Institute GIG
Department of Energy Saving and Air protection
Katowice, Poland

Katowice, 14.10.2020
Scheme of the measuring system for CO$_2$ sorption

Above ground part of the installation

- Gas cylinders
- CO$_2$ pre-heater
- Pressure reducer for gas cylinders

Underground part of the installation

- Flow meter 1500 dm$^3$/h
- Mass flow controller Bronkhorst 2-100 dm$^3$/min CO$_2$
  (120-6000 dm$^3$/h)
- For vacuum pump

- Pressure and Temperature Meter
- Pressure Meter
- Five remote-controlled valves

Drilled hole
Coal seam

Project ROCCS
Operation modes and controlling system

Mode 1 - CO₂ sorption

In the sorption mode, we test the gas flow towards the sorbent at a given constant pressure.
Flow measurement is possible in two measuring ranges, automatically switchable.

Measuring range 1: 0.6..30 dm³/h CO₂
Measuring range 2: 30..1 500 dm³/h CO₂

Mode 2 – Desorption

The desorption mode tests the gas flow from the sorbent towards the vacuum pump.
Measuring ranges are the same as for Mode 1.
Controlling the design and measuring system

The control system will be built on the basis of a miniserver from Loxone.

The miniserver is equipped with discrete input/output systems and an Ethernet communication interface, supporting the Modbus TCP communication protocol, through which communication with flowmeters and pressure regulators from Brokhorst will be implemented.

Apart from the control functions, the measurement data will be recorded on a microSD card. As a user interface, a dedicated application will be developed specifically for the control system.

The application can be accessed from:

- A tool application installed on a PC,
- A tool application for Android or iOS mobile devices,
- From the level of webpage.

Access to measurement data will be available from the built-in FTP server.
Thank you very much for your attention
ROCCS Project First Workshop

Mikołów, 14th October 2021
Height 140 cm
Length 120 cm
Width 80 cm
Weight 715 kg
Thank you for your attention