

MiReCOL: developing corrective measures for CO₂ storage

F. Neele^a, A. Grimstad^b, M. Fleury^c, A. Liebscher^d, A. Korre^e, M. Wilkinson^f

^aFilip.Neele@tno.nl, TNO, Utrecht, The Netherlands
 ^bSINTEF Petroleum Research, Trondheim, Norway
 ^cIFPEN, Rueil-Malmaison, France
 ^dGFZ, Potsdam, Germany
 ^eImperial College, London, United Kingdom
 ^fUniversity of Edinburgh, United Kingdom

May 11 2015







Significant irregularities?





Significant irregularities?



May 11 2015



Currently available techniques

Existing techniques

- → Pressure management
- \rightarrow Back production of CO₂
- Well remediation techniques







MiReCOL objective

To develop a toolbox of techniques available to mitigate / remediate undesired migration or leakage of CO₂

→ Support the definition of corrective measures plans

Help building confidence in deep subsurface

storage of CO₂



6



Project approach

1. Create an inventory of **existing** remediation techniques

- Study merit for number of real / realistic storage complexes, e.g.:
 - Fluid migration control through pressure management
 - → Remediation techniques for leakage along well

2. Add **new** remediation techniques

- → Study merit for number of real / realistic storage complexes, e.g.:
 - → Sealants
 - → Smart materials in wells
- 3. Focus is on mitigation and remediation techniques in **deep subsurface**
 - Corrective measures in (near-) surface region: use literature overview and other projects



Project approach

Central concept is risk level

- Merit of mitigation or remediation technique is obtained by establishing overall risk level *before* and *after* deployment of the technique
 - **Unmitigated risk** (i.e., threat or leak has occurred, but no action is taken)
 - Mitigated risk (i.e., residual risk of threat or leak after deployment of mitigation or remediation technique, plus the impact of the deployment of the technique on the risk level of the storage site)



A mitigating or remediating action should be taken only when the mitigated risk is lower than the unmitigated risk



Project approach

Site specificity vs general guidelines

- The details of threats to safe and secure storage, and of leakage events are strongly site specific, and so are the options to mitigate or remediate
- The project will study mitigation and remediation techniques on a range of real or realistic storage complexes, to derive a range of site-specific results, from which more general conclusions will be drawn





Example: back production



Gas back production data at K12-B. Data used to assess feasibility of backproducing injected CO_2 as corrective measure Installations at Ketzin (Germany) For back-production test. Data to be used to asses feasibility Of back producing stored CO₂.



Picture courtesy T. Kollersberger, GFZ

May 11 2015



Example: flow diversion



May 11 2015



May 11 2015



Result of the project

- "Handbook" of remediation and mitigation options that can be applied in different parts of storage complex, against various leakage scenarios.
 - Handbook to inform operators, regulators, public
 - Results in handbook based on modelling for specific sites, to illustrate value of remediation & mitigation options
- The Handbook will also be implemented in a webbased tool that allows easy access to the project's results
 - This tool will also support operators in setting up a corrective measures program



MiReCOL – results, handbook Stakeholder input required

- Project started March 2015, now in second year
- Technical results available at and of year 2 (March 2016)
- → Year 3 of project:
 - Formulate guidelines for mitigation / remediation measures
 Write / implement Handbook
- MiReCOL & CCS projects, stakeholders
 Interaction needed to optimise Handbook
 - `Event' around March 2016
 - Presentation of results
 - Proposal for Handbook
 - Discussion with stakeholders

Please contact us! Coordinator: Filip Neele (TNO) filip.neele@tno.nl





MItigation and Remediation of CO₂ Leakage

Project granted under EU FP7 Energy – Theme 5.2 Mitigation and remediation of leakage from geological storage <u>filip.neele@tno.nl</u>

www.mirecol-co2.eu

