CSLF Workshop on
Risk and Liability of Geological Storage
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Session 6. How Safe is Safe Enough? (cont’d)

Discussion leaders
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Questions

- What will make investors comfortable?
- What geosciences information can create that comfort?

- What concepts and approaches for risk communication can be used?
- How can geosciences participate in effective communications?
- Are there relevant examples of effective or ineffective communications for geologic storage or from other fields?
What will make investors comfortable?

Safe enough ...

- for securing an attractive ROI (business case, value of CO2)
  - from 1 to 20 €/tCO2, CAPEX, geological uncertainty
- for allowing a transparent liability transfer from the operating companies to the public authorities (well stated regulatory framework)
- for minimizing technical risks and gaining public support
What geosciences information can create that comfort?

Issues

- **improving performance**
  - capacity, containment, injectivity, plume expansion, economics

- **permits**
  - characterization, injection, closure, post-closure

- **derisking the storage**
  - monitoring and surveillance, well and cap-rock integrity

regulatory regime

economics

technical risk/public perception
What geosciences information can create that comfort?

- **Safe and permanent storage** – To demonstrate that after 20-30 years of monitoring there won't be any evidence of a possible leakage.

- How to assess the long term behavior of a CO2 storage?
  - Monitoring / surveillance surveys
  - Use of gauges (surface, downhole)
  - Use of a numerical simulator
    - observations vs simulations

- **Acceptable leakage rate**
  - Data acquisition – level of accuracy
  - Numerical simulations, prediction
What concepts and approaches for risk communication can be used?

- Zero risk cannot not be guaranteed
- Ensuring a long term safe storage requires to compare observations with predictions
  - decide about corrective actions, remediation techniques
  - setting up of both preventive and protective barriers.
- Regulatory framework: a stage-gate process
  - successive sanctions, no guaranty that the storage permitting process will pass all the gates
    - exploration: identification of a potential site;
    - characterization, design of the injection infrastructure
    - injection with monitoring and verification
    - closure: surveillance to calibrate the long term prediction of the storage safety and permanency.
How can geosciences participate in effective communications?

- **CO2 plume expansion with time**
  - what is not seen is perceived as a threat

- **Remediation**
  - prevention
  - detection of leakage
  - remediation

- **Safety increases with time**
  - most of the events will happen during the first decades when the storage is fully instrumented and monitored
  - CO2 dissolves and then sinks
  - CO2 becomes less and less mobile

*Source: BGS*
Are there relevant examples of effective or ineffective communications for geologic storage or from other fields?

- The Lacq project (TOTAL)
  - communication took time but was effective

- Barendrecht?
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