Carbon Sequestration leadership forum

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Report of the Task Force on Review of CO_2 Storage Efficiency in Deep Saline Aquifers

Stefan Bachu, Canada, Task Force Chair

Origin of the Task Force

The Task Force was established at the CSLF meeting in Washington, D.C., USA, November 5, 2013, to review the published literature since IPCC SRCCS (2005) and CSLF report (2007) on the efficiency of CO_2 storage in deep saline aquifers

Background of the Task Force

- Various methodologies have been developed since 2007 for estimating CO_2 storage capacity in deep saline aquifers at regional and local scales, the most used being USDOE's, applied mostly in North America, and CSLF's, applied mostly in Europe
- Storage capacity estimates are of two types:
  - Volumetric (or "Static"), based on pore volume
  - Dynamic, based on injectivity and pressure build-up, usually using numerical modelling

Storage Efficiency

- The volumetric, or static CO_2 storage capacity estimates are based on the relationship:

$$M_{CO2} = E \times A \times h \times \phi \times \rho_{CO2}(P, T)$$

- Published values of the Storage Efficiency Coefficient E, defined as ***the amount of CO_2 stored in a unit of aquifer pore volume***, vary in a wide range, from < 1% to > 20%, depending on assessment scale, rock lithology, depositional environment, CO_2 buoyancy and mobility, capillary forces, and other medium and storage characteristics

Task Force Mandate

Critically review, compile and report on published literature since the CSLF (2007) report on "CO_2 Storage Capacity Estimation", on the efficiency of CO_2 storage in deep saline aquifers and applicability of the various published values for the storage efficiency coefficient E

Task Force Membership

- Canada (Chair): Stefan Bachu
- Australia Clinton Foster
- France Didier Bonijolyi
- United States Angela Goodman, Charles Gorecki

Preliminary Report Outline

1. Executive Summary
2. Introduction (Task Force mandate, scope and objective of the report)
3. Factors affecting the spread of a plume of injected CO_2, hence storage efficiency: buoyancy (due to density differences), mobility (due to viscosity differences), capillary forces; relative permeability, medium lithology and heterogeneity, etc.
4. Volumetric storage efficiency estimates and applicability
5. Dynamic storage efficiency evaluations (i.e., effects of pressure build-up and injection rate) and relationship with volumetric estimations
6. Engineering possibilities for increasing storage efficiency
7. Storage capacity resources and reserves
8. Summary and Conclusions

Activities to Date

Identified and collected literature on the subject:

- More than 70 published papers and reports
- 3 papers in press
- 4 papers to be presented at the 12th International Conference on Greenhouse Gas technologies, Austin, TX, USA, October 5-9, 2014

Task Force Timeframe

- November 2013: Task Force established
- March 2014: Literature collected
- Fall 2014 CSLF Meeting: Draft report completed
- Spring 2015 CSLF TG Meeting: Final report submitted

Questions and Comments?