



IEA Greenhouse Gas R&D Programme



IEA GHG Monitoring Network

***CO₂ Geological Storage Modelling
Workshop***

Orleans, France, February 2009



CO₂ Storage Monitoring

- Can be deep focussed (performance) or shallow (leakage/impacts)
- Required during various phases and for different storage scenarios
- Required for stakeholder confidence, regulatory approval and verification



History of Monitoring Network

- First meeting held in California, 2004
- Subsequent annual meetings:
 - Rome, 2005
 - Melbourne, 2006
 - Edmonton, 2007
 - Joint network meeting, New York 2008
- Next meeting: Japan, June 2009



Aims and Objectives

- Overall aims:
 - Facilitate exchange of ideas between experts
 - Improve design and implementation
- Specific objectives:
 - Determine accuracy, applicability and limitations of existing and new techniques
 - Disseminate information from R&D and pilots
 - Develop monitoring guidelines



Range of Available Tools

- First network meeting identified a large range of monitoring tools available
- Subsequent discussions focussed on integration of techniques into programmes
- Confidence building and cost considerations
- Web based Monitoring Selection Tool (BGS)
- www.co2captureandstorage.info



Monitoring Selection Tool

CO₂ Capture and Storage

Monitoring Selection Tool

Scenario summary: New Scenario [2009-02-04 10:58:46]

Location: Onshore; **Depth:** 1500 to 2500 m; **Type:** Oil; **Quantity:** 500.000 Mt (50.000 Mt/yr for 10.0 yrs);
Package: BGS+Populated+Syn-injection+Additional

Tool	Rating %	Migration	Quantification	Seismicity	Integrity	Confidence
Multicomponent surface seismic	75	3.0	4.0	2.0	3.0	3.0
Surface gas flux	50	1.0	3.0	0.0	3.0	3.0
Bubble stream detection	45	1.0	2.0	0.0	3.0	3.0
Long-term downhole pH	40	3.0	2.0	0.0	0.0	3.0
Tracers	30	2.0	0.0	0.0	2.0	2.0
Cross-hole seismic	30	1.0	3.0	0.0	1.0	1.0
Fluid geochemistry	28	1.0	1.3	0.0	2.0	1.3
Vertical seismic profiling (VSP)	25	1.0	2.0	0.0	1.0	1.0
Satellite interferometry	20	1.0	0.0	2.0	0.0	1.0
Surface gravimetry	19	2.0	0.9	0.0	0.0	0.9
Cross-hole EM	17	1.0	0.9	0.0	1.0	0.4
Airborne EM	15	1.0	0.0	0.0	1.0	1.0

Control panel

Quantity of injected CO₂

Injection rate [Mt/year]: Duration [years]:

Landuse at proposed storage site

Populated	Agricultural	Wooded	Arid	Protected
✓	✗	✗	✗	✗

Monitoring phase

Pre-injection	Injection	Post-injection	Post-closure
✗	✓	✗	✗

Monitoring aims

Plume	Top-Seal	Migration	Quantification	Efficiency
✗	✗	✓	✓	✗

Calibration Leakages Seismicity Integrity Confidence

✗	✗	✓	✓	✓
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Monitoring package

Basic	Additional	All
✗	✓	✗

Buttons: Tool catalogue, Run, Print-friendly page, Create CSV

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Future Network Focus

- Results from pilots and demonstration projects
- Update Monitoring Selection Tool
- Potential for accurate quantification
- Maximisation of data derived from seismic surveys and integration with other techniques
- Adequacy of monitoring techniques
- Duration of post-injection monitoring