Characterisation of European CO_2 storage

Dry-run licence applications

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Motivation

- To date, no applications have been made for storage permits under the Storage Directive
- Demonstration projects are working towards submitting permits but are not yet ready
- SiteChar will test the process of permit development at credible sites
  - Not constrained by the commercial sensitivities associated with real projects
  - ‘Low risk’ dry-run environment
  - Allows testing of permitting in future storage situations (onshore and offshore in saline aquifers)
  - Allows testing and refinement of the SiteChar workflow

SiteChar process:

- Two sites will develop and submit dry-run storage permit applications:
  - Moray Firth Site, UK North Sea
  - Vedsted Site, onshore Denmark
- These will be evaluated by a *separate and independent* regulatory team, comprising SiteChar partners
- The Moray Firth application will also be considered by the CCS Regulatory Contact Group, coordinated by Scottish Government
- Evaluation will be constructive, iterative and through close dialogue to maximise the 'learning'
- SiteChar has a Regulatory Advisory Panel, comprising external representatives from industry, regulators and geotechnical advisors

SiteChar approach for sites

SiteChar teams

- Characterise sites
- Submit storage permit applications:
  - Interim March 2012
  - Final December 2012

Separate SiteChar regulatory team

- Independent 'regulator'
- Provide technical recommendations for site characterisation
- Provide best practice guidance for storage permitting from the perspective of both applicant and regulator

Regulatory Contact Group for UK site

- Provide informal review and feedback on storage permit applications and process

Regulatory Advisory Panel

- Advises on the approach for regulatory steering and licensing
- Evaluates site characterisation activities
- Provides guidance on the content of dry-run storage permit applications
- Critically reviews reports produced

Output

Technical best practice for

- Storage site characterisations
- Storage permit applications

Scope of licence applications

- We will develop credible, if limited, licence applications with ‘research-level’ resources
- We are planning to develop, submit and review applications for a storage permit:
  - This will include most of the key elements as required by the Storage Directive
- Out of scope:
  - Full EIA
  - Provision relating to the acceptance and injection of CO_2
  - Details of financial security
  - A provisional post-closure plan
  - Provisions for reporting

Storage Permit Application content	Interim Mar 2012	Final Dec 2012
1. Name and address of proposed operator	✓	
2. Appraisal term	✓	
3. Project description		
i. Injection parameters and project concept	✓	
ii. Storage development plan incl.		✓
Injection & Operating plan		✓
Storage Performance Forecast		✓
4. Site description		
i. Boundaries	✓	
ii. Site geology, hydrogeology…	✓	
iii. Past development history	✓	
iv. Storage capacity estimate	Draft?	✓
5. Measures to prevent significant irregularities		
i. Risk register	✓	✓
ii. Plan of risk mitigation	Draft	✓
iii. Dialogue with stakeholders	Draft	✓
6. Monitoring plan		✓
7. Corrective measures plan		
i. Key Performance Indicators	✓	
ii. Corrective measures plan (provisional)		✓
8. Post-closure plan		
i. Key Performance Indicators	✓	
ii. Post-closure plan (provisional)		✓
9. Environmental Impact Assessment		
i. Description of relevant features	✓	

Site Characterisation

Risk Assessment

Key Performance Indicators

Comparisons between Vedsted and Moray Firth – permitting perspective

Moray Firth

- Offshore
- Interpretation of existing data, new static model and predictive modelling of key risks
- Identified from previous regional reviews of UK northern North Sea storage targets
- 'Theoretical' study
- Low risk – can try different permitting scenarios
- No acquisition of new data
- Range of injection scenarios

Vedsted

- Onshore
- Interpretation of existing data, new static model and predictive modelling of key risks
- Previously applied for a storage licence prior to Directive to promote dialogue with Regulators
- Real project, now stopped
- SiteChar application will fit predefined concept & original licence application
- Baseline monitoring data being acquired and will inform permit application

Comparisons between Vedsted and Moray Firth – permitting perspective

Moray Firth

- Risks being addressed in SiteChar:
  - Definition of site and complex boundaries
  - Caprock integrity
  - Potential for seismic monitoring and minimum detection limits

Vedsted

- Risks being addressed in SiteChar:
  - Oil well integrity and abandonment status
  - Potential effects of regional pressure responses and the potential to manage these by water production

Key questions on permitting so far...

- Definition of storage complex from Directive:
  - *The storage site and surrounding geological domain which can have an effect on overall storage integrity and security; that is, secondary containment formations*
- Defining the complex boundary:
  - How is the complex boundary defined when the potential for (risk of) migration may occur over significant distances laterally?
  - How is the complex boundary defined, where pressure changes may be detected at significant distances beyond the storage site?
- Monitoring
  - Can an operator undertake direct in situ monitoring (i.e. in a well) outside the complex?
    - Chikkatur, 2011 suggests this is possible
  - How would this be regulated?

Key questions on permitting so far...

- Key Performance Indicators
  - KPIs define limits to expected site behaviour which, if exceeded, indicate that a significant irregularity or leakage has occurred. This will trigger appropriate corrective measures.
  - KPIs are identified through risk assessment and help to inform the corrective measures and monitoring plans.
- Defining ‘acceptability’
  - When defining Key Performance Indicators, objectives are qualified by the following terms. How should these be defined in both a qualitative and quantitative sense?
    - ‘Detrimental’ – e.g. *No detrimental induced seismic activity*
    - ‘Adverse’ – e.g. *No adverse environmental impact*
    - ‘Significant’ – e.g. *Significant irregularity*

Next steps

- End March 2012: receipt of interim storage permit applications from Moray Firth & Vedsted site teams
- Review of interim permit applications: April-May 2012
- Interim storage permit applications reviewed - Feedback to site teams on interim permits enables further revision of applications. Due June 2012
- Reviews by SiteChar team and, for UK site, the CCS Regulatory Contact Group
- Public awareness result on North Sea site: Oct 2012
- Final storage permit application: December 2012
- Lessons drawn, recommendations for best practice and identification of issues that might hinder CCS deployment: December 2013.

THANK YOU
– ANY QUESTIONS?