Global Storage Resource Analysis for Policymakers

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IEA CCS Costs Workshop
Paris, 22nd – 23rd March 2011
Introduction

- Study being undertaken by Geogreen, and funded by GCCSI, commenced 2010, in progress
- Primary objective - Alert policymakers to the scale, cost and timing of the storage resource assessment, required to enable deployment of commercial-scale CCS projects by 2020: 20 projects envisaged by G8 Leaders, and 100 projects in IEA CCS Roadmap.
Basin Exploration level
Estimated project timeline

<table>
<thead>
<tr>
<th>Deep Saline Formation</th>
<th>IEA GHG Timing min</th>
<th>IEA GHG Timing max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 Desk Based assessment</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Licensing Exploration Permit</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Phase 2 Site confirmation &amp; characterization</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Phase 2 Injection Test</td>
<td>1</td>
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<tr>
<td>Bankable</td>
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<tr>
<td>Licensing Demo</td>
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<tr>
<td>Phase 3: Construction and Start up</td>
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<td>Injection &amp; Storage Demo</td>
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<td>Bankable</td>
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<td>Detail design Commercial</td>
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<tr>
<td>Licensing Commercial</td>
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<td>3</td>
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<tr>
<td>Phase 4: Construction &amp; Well integrity check</td>
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<tr>
<td>Injection &amp; Storage Commercial</td>
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<td>Injection &amp; Storage Commercial</td>
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<tr>
<td>Closure</td>
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<thead>
<tr>
<th>Depleted Oil and Gas Field</th>
<th>IEA GHG Timing min</th>
<th>IEA GHG Timing max</th>
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<tr>
<th>CO2 - EOR</th>
<th>IEA GHG Timing min</th>
<th>IEA GHG Timing max</th>
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<td>Licensing EOR Test</td>
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<td>Phase 2 Construction and Well assessment</td>
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<td>Phase 2 Injection Test</td>
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<td>Closure</td>
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## DSF Bankability workflow

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Phase</th>
<th>Major costs items</th>
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<tbody>
<tr>
<td>National based</td>
<td>Phase 0 Screening</td>
<td>First desktop studies</td>
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<tr>
<td><strong>Non exclusive surveys</strong></td>
<td></td>
<td>Desktop studies, where possible seismic reprocessing and existing wells logs analysis (including communication on project)</td>
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<tr>
<td>Project based</td>
<td>Phase 1 Desk Based assessment</td>
<td>Administrative engineering and follow-up</td>
</tr>
<tr>
<td><strong>Exclusive surveys</strong></td>
<td>License Exploration Permit</td>
<td>Studies and engineering for this phase (including monitoring actions, equipments and monitoring (soil, gravimetric, Insar))</td>
</tr>
<tr>
<td></td>
<td>Phase 2 Site confirmation &amp; characterization</td>
<td>Seismic acquisitions 2D</td>
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<tr>
<td></td>
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<td>Seismic acquisitions 3D (on CO₂ future plume only)</td>
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<td></td>
<td>Civil Engineering</td>
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<td>Drilling CO₂ well with rotary rig (including 20% contingency including Mob/demob)</td>
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<td>Injection test permitting</td>
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<tr>
<td></td>
<td>License Injection test</td>
<td>Studies and monitoring</td>
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<tr>
<td></td>
<td>Phase 2 Injection Test</td>
<td>Injection test duration</td>
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<td>CO₂ injection cost</td>
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<td><strong>Bankable</strong></td>
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How many project will be bankable in 2015? in 2050?

Projects data base

Phase 0 Screening
Phase 1 Desk Based assessment
Licensing Exploration Permit
Phase 2 Site confirmation & characterization
Licensing injection test
Phase 2 Injection Test

Number of projects financed in 2020

Development time model

How many projects to finance to match development objectives?

Development time model + success rate to 2015

Number of projects to finance to achieve 2050 objective

Development needs in 2030 - 2050

CO₂ sources data base

Number of projects financed in 2020

Development time model + success rate to 2015

Number of projects to finance to achieve 2050 objective

Development needs in 2030 - 2050

CO₂ sources data base

Development time model + success rate to 2015

Number of projects to finance to achieve 2050 objective

Development needs in 2030 - 2050

CO₂ sources data base
Total cost distribution for onshore bankability for an intensely explored area

The distributions includes estimated failure costs of data acquisition, wells…
Costs – key points

- Cost models are considered for onshore and offshore storage options both in Deep Saline Formations and Depleted Oil and Gas Fields
- Take account of failed storage sites
- Numerous possibilities for each site to reach a successful path
- Cost models include an assessment of the economic uncertainties of project bankability

- Draft Report delivered March 2011
Thank you