



Global Storage Resource Analysis for Policymakers

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IEA CCS Costs Workshop

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Introduction

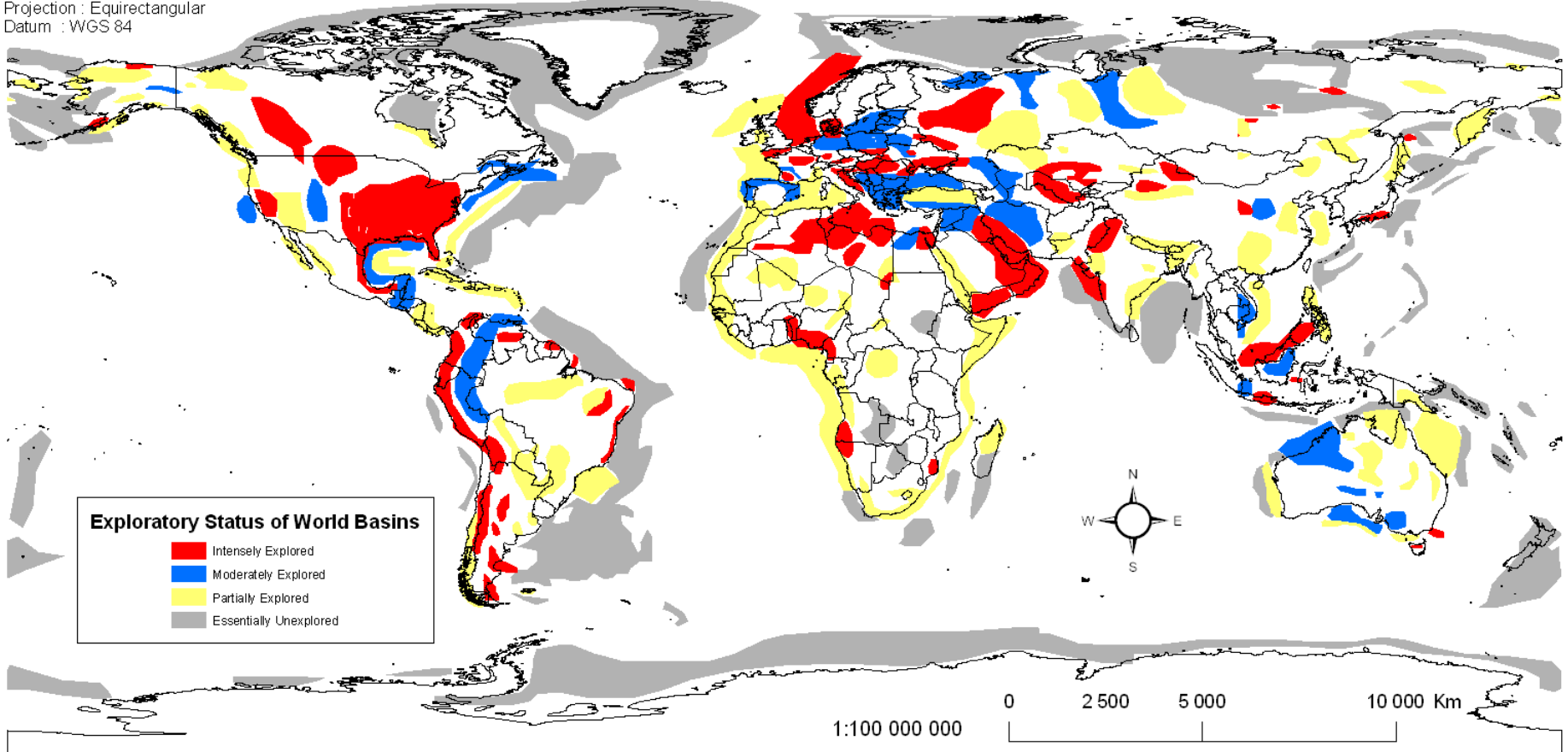


- Study being undertaken by Geogreen, and funded by GCCSI, commenced 2010, in progress
- Primary objective - Alert policymakers to the scale, cost and timing of the storage resource assessment, required to enable deployment of commercial-scale CCS projects by 2020: 20 projects envisaged by G8 Leaders,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

Basin Exploration level



Projection : Equirectangular
Datum : WGS 84



Estimated project time line



| Deep Saline Formation | IEA GHG Timing min | IEA GHG Timing max |
|----------------------------------------------|-----------------------|-----------------------|
| Phase 1 Desk Based assessment | 0.5 | 1 |
| Licensing Exploration Permit | 1 | 2 |
| Phase 2 Site confirmation & characterization | 1 | 4 |
| Phase 2 Injection Test | 1 | 4 |
| Bankable | | |
| Licensing Demo | 1 | 2 |
| Phase 3: Construction and Start up | 1 | 3 |
| Injection & Storage Demo | 1 | 5 |
| Bankable | | |
| Detail design Commercial | 1 | 2 |
| Licensing Commercial | 1 | 3 |
| Phase 4: Construction and Start up | 1 | 3 |
| Injection & Storage Commercial | 5 | 50 |
| Closure | | |

| Depleted Oil and Gas Field | IEA GHG Timing min | IEA GHG Timing max |
|----------------------------------------------|-----------------------|-----------------------|
| Phase 1 Desk Based assessment | 0.5 | 1 |
| Licensing Injection Test | 0.5 | 2 |
| Phase 2 Site confirmation & characterization | 0.5 | 1 |
| Phase 2 Injection Test | 0 | 0.5 |
| Bankable | | |
| Detail design Commercial | 1 | 2 |
| Licensing Commercial | 1 | 3 |
| Phase 4: Construction & Well integrity check | 1 | 3 |
| Injection & Storage Commercial | 5 | 50 |
| Closure | | |

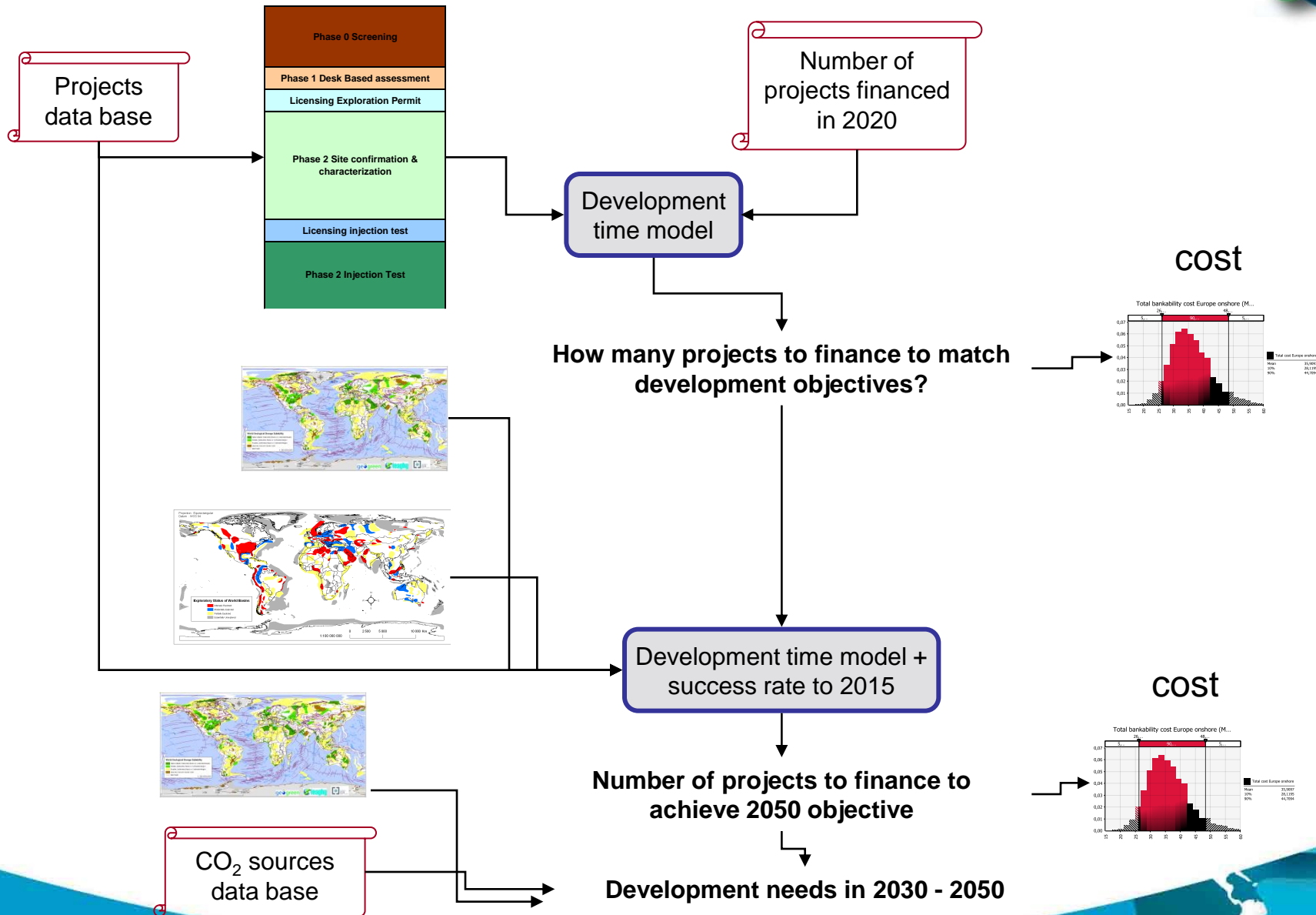
| CO2 - EOR | IEA GHG Timing min | IEA GHG Timing max |
|----------------------------------------------|-----------------------|-----------------------|
| Phase 1 Desk Based assessment | 0.5 | 1 |
| Licensing EOR Test | 0.1 | 0.5 |
| Phase 2 Construction and Well assessment | 0.5 | 1 |
| Phase 2 Injection Test | 0 | 0.5 |
| Bankable | | |
| Detail design Commercial | 1 | 2 |
| Licensing Commercial | 0.5 | 1 |
| Phase 4: Construction & Well integrity check | 1 | 3 |
| Injection & Storage | 5 | 10 |
| Closure | | |

DSF Bankability workflow



| Type of study | Phase | Major costs items |
|------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National based <i>Non exclusive surveys</i> | Phase 0 Screening | First desktop studies |
| | Phase 1 Desk Based assessment | Desktop studies, where possible seismic reprocessing and existing logs analysis (including communication on project) |
| Project based <i>Exclusive surveys</i> | Licensing Exploration Permit | Administrative engineering and follow-up |
| | Phase 2 Site confirmation & characterization | Studies and engineering for this phase (including monitoring action equipments and monitoring (soil, gravimetric, Insar)) Seismic acquisitions 2D Seismic acquisitions 3D (on CO ₂ future plume only) |
| | Licensing Injection test | Civil Engineering Injection test permitting |
| | Phase 2 Injection Test | Drilling CO ₂ well with rotary rig (including 20% contingency including Mob/demob) Studies and monitoring Injection test duration CO ₂ injection cost |
| Bankable | | |

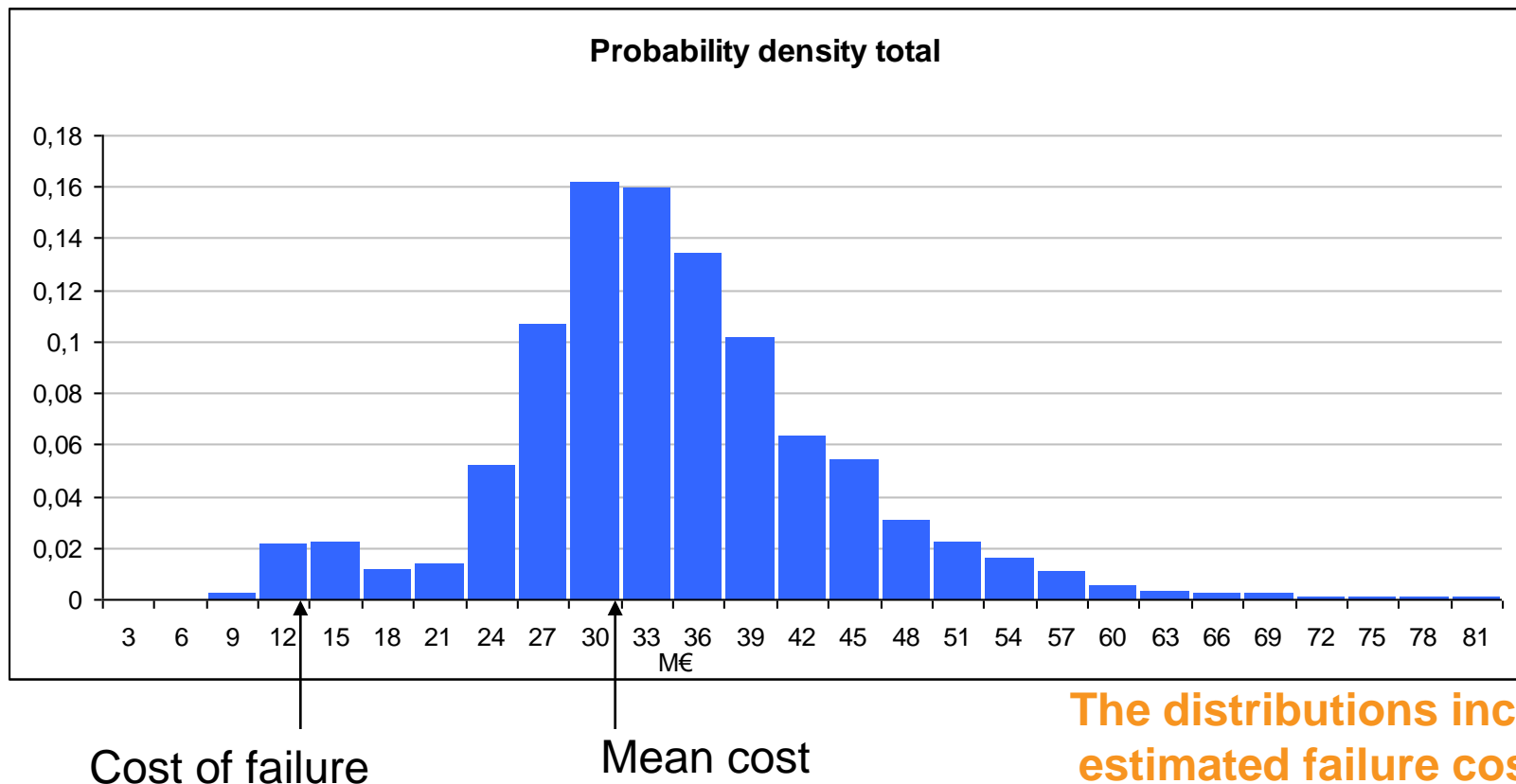
How many project will be bankable in 2015? in 2050?



DFS European project cost



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