



Statoil

Task Force on UNFC2009 and Recipient Reservoirs

Status Presentation

EGRC Meeting, 2-4 May 2012

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Task Force on UNFC and Recipient Reservoirs

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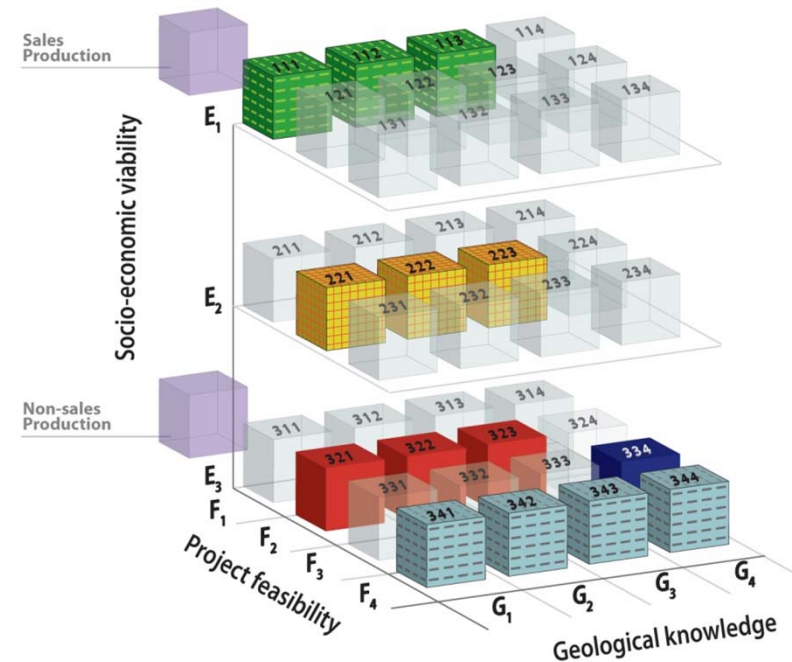
Injection project activities - the simple picture

- A reminder from 2010-2011

We need to:

- Understand the geology and dynamic behaviour of the recipient reservoir
- Design a technical concept and evaluate the project feasibility
- Calculate the costs and evaluate the economic and social viability of the project
- Make decisions

These are all activities that we know from oil and gas extraction projects and that are well defined in the UNFC2009



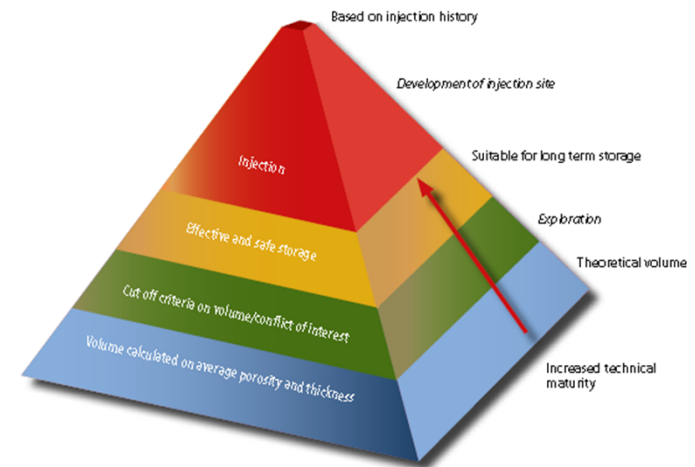
Task Force on UNFC and Recipient Reservoirs

- 2011-2012 work program as presented at the EGRC in 2011

- a) Identify the main stakeholder groups and clarify what the needs and expectations of these different groups are
- b) Look in to other systems currently used and how these are applied
- c) Review the Underground Gas Storage (UGS) Study prepared by the UNECE Working Party on Gas and consider the relevant elements therein for developing an applicable classification
- d) Propose how to adapt the UNFC-2009 for use on injection projects

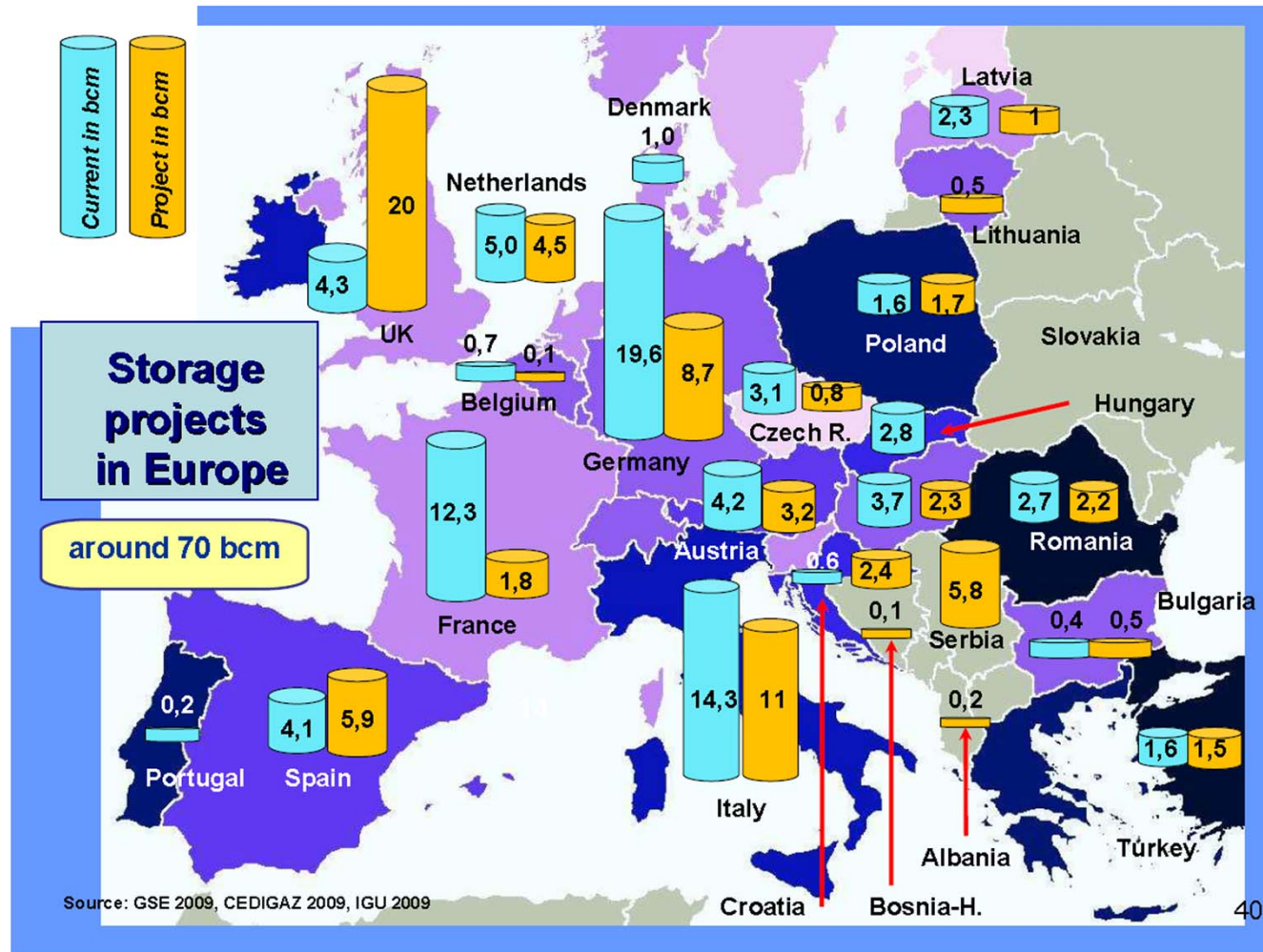
Stakeholders have very different needs

- Type of injection/storage projects
 - Hydrocarbon gas storage
 - CO₂ storage (CCS)
 - EOR projects
 - Other waste products
- Significant difference in scale
 - Basin- and regional-scale assessments and screening
 - Local- and site-scale assessments
 - Injection projects, developed or under development
- Assessment of storage capacity versus classification of project activities



Working Party on Gas – UGS Study

Study on Underground Gas Storage in Europe and Central Asia



Working Party on Gas – UGS Study

- Originally proposed structure

1. New and emerging technologies
2. Current UGS status – Data base for all existing UGS plants
3. Market structure and legal framework
4. UGS projects – Data base for planned projects...including criteria for selecting projects
5. Legal framework for development and operation'
6. Tariffs of UGS
7. Outlook and main expected trends of UGS markets
 - Describe the gas market evolution and define the UGS needs
 - Gas supply and demand and Storage supply and demand

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DEFINITION OF CATEGORIES AND SUPPORTING EXPLANATIONS

First draft proposals

F Categories – Possible definitions

Category	Definition – extraction projects	Possible definition – injection projects
F1	Feasibility of extraction by a defined development project or mining operation has been confirmed.	Feasibility of injection and storage by a defined injection project has been confirmed.
F2	Feasibility of extraction by a defined development project or mining operation is subject to further evaluation.	Feasibility of injection and storage by a defined injection project is subject to further evaluation.
F3	Feasibility of extraction by a defined development project or mining operation cannot be evaluated due to limited technical data.	Feasibility of injection and storage by a defined injection project cannot be evaluated due to limited technical data.
F4	No development project or mining operation has been identified.	No injection/storage project has been identified.

F1 Category – Supporting Explanations

Extraction Projects		
Category	Definition	Supporting Explanation
F1	Feasibility of extraction by a defined development project or mining operation has been confirmed.	Extraction is currently taking place; or, implementation of the development project or mining operation is underway; or, sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined development project or mining operation.

Injection Projects		
Category	Possible Definition	Possible Supporting Explanation
F1	Feasibility of injection and storage by a defined injection project has been confirmed.	Injection/storage is currently taking place; or, implementation of an injection/storage project is underway; or, sufficiently detailed studies have been completed to demonstrate the feasibility injection/storage by implementing a defined project.

F2 Category – Supporting Explanations

Extraction Projects		
Category	Definition	Supporting Explanation
F2	Feasibility of extraction by a defined development project or mining operation is subject to further evaluation.	Preliminary studies demonstrate the existence of a deposit in such form, quality and quantity that the feasibility of extraction by a defined (at least in broad terms) development project or mining operation can be evaluated. Further data acquisition and/or studies may be required to confirm the feasibility of extraction.

Injection Projects		
Category	Possible Definition	Possible Supporting Explanation
F2	Feasibility of injection and storage by a defined injection project is subject to further evaluation.	Preliminary studies demonstrate the existence of a recipient reservoir in such form, quality and quantity that the feasibility of injection/storage by a defined project can be evaluated. Further data acquisition and/or studies may be required to confirm the feasibility of injection/storage

F3 Category – Supporting Explanations

Extraction Projects		
Category	Definition	Supporting Explanation
F3	Feasibility of extraction by a defined development project or mining operation cannot be evaluated due to limited technical data.	Very preliminary studies (e.g. during the exploration phase), which may be based on a defined (at least in conceptual terms) development project or mining operation, indicate the need for further data acquisition in order to confirm the existence of a deposit in such form, quality and quantity that the feasibility of extraction can be valuated.

Injection Projects		
Category	Possible Definition	Possible Supporting Explanation
F3	Feasibility of extraction by a defined development project or mining operation cannot be evaluated due to limited technical data.	Very preliminary studies (i.e. screening phase), which may be based on a defined project activity, indicate the need for further data acquisition and/or further studies in order to confirm the existence of a recipient reservoir and seal in such form, quality and quantity that the feasibility of injection/storage can be evaluated.

F4 Category – Supporting Explanations

Extraction Projects		
Category	Definition	Supporting Explanation
F4	No development project or mining operation has been identified.	In situ (in-place) quantities that will not be extracted by any currently defined development project or mining operation.

Injection Projects		
Category	Possible Definition	Possible Supporting Explanation
F4	No injection/storage project has been identified.	Reservoir (volume) that will not be utilized for injection/storage by any currently defined project activity or operation.

G Categories – Possible definitions

Category	Definition – extraction projects	Possible definition – injection projects
G1	Quantities associated with a known deposit that can be estimated with a high level of confidence.	Volumes* associated with a known recipient reservoir that can be estimated with a high level of confidence.
G2	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	Volumes* associated with a known recipient reservoir that can be estimated with a moderate level of confidence.
G3	Quantities associated with a known deposit that can be estimated with a low level of confidence.	Volumes* associated with a known recipient reservoir that can be estimated with a low level of confidence.
G4	Estimated quantities associated with a potential deposit, based primarily on indirect evidence.	Estimated volumes* associated with screening projects.

*) Storage capacity, available volume and/or injection rate?

G Categories – Supporting Explanations

Extraction Projects	
Category	Supporting Explanation
G1	<p>For in situ (in-place) quantities, and for recoverable estimates of fossil energy and mineral resources that are extracted as solids, quantities are typically categorised discretely, where each discrete estimate reflects the level of geological knowledge and confidence associated with a specific part of the deposit. The estimates are categorised as G1, G2 and/or G3 as appropriate.</p> <p>For recoverable estimates of fossil energy and mineral resources that are extracted as fluids, their mobile nature generally precludes assigning recoverable quantities to discrete parts of an accumulation. Recoverable quantities should be evaluated on the basis of the impact of the development scheme on the accumulation as a whole and are usually categorised on the basis of three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.</p>
G2	
G3	
G4	<p>Quantities that are estimated during the exploration phase are subject to a substantial range of uncertainty as well as a major risk that no development project or mining operation may subsequently be implemented to extract the estimated quantities. Where a single estimate is provided, it should be the expected outcome but, where possible, a full range of uncertainty in the size of the potential deposit should be documented (e.g. in the form of a probability distribution). In addition, it is recommended that the chance (probability) that the potential deposit will become a deposit of any commercial significance is also documented.</p>

G Categories – Possible Supporting Explanations

Injection Projects	
Category	Possible Supporting Explanation
G1	Storage capacity is estimated based on detailed geological data from the recipient reservoir and the overlying seal(s), including injection data and results from monitoring of the sealing capacity during injection.
G2	Storage capacity is estimated based on geological data including porosity, permeability and structure of the recipient reservoir and properties of the seal. The evaluation is based on geological modeling and reservoir simulation.
G3	Storage capacity is estimated from geologically mapped pore volume of the recipient, permeability of the aquifer and sealing capacity based on available data. Volumes which are likely to be in conflict with future management of ground water, petroleum or other resources have been excluded.
G4	Available reservoir volumes that are estimated during a screening phase. Normally subject to a substantial range of uncertainty as well as a major risk that no injection project may be implemented.

E Categories

Socio-Economic viability of a project

- Economy
 - May be a challenge for certain injection projects such as CO₂ storage
 - EOR will generate cash flow, other projects may struggle
- Social acceptance
 - Is often a challenge – “Not in my back yard!”

Sealing capacity and risk of leakage

- Is the seal sufficient?
 - Geological seal
 - Technical seal (old wells)
 - Dependant on rates and volumes
- If there is a risk of leakage, shall this be handled in the classification and if so how?
 - Volume risk – G
 - Technical issue – F
 - Cost issue – E

The way forward

- Continue to work on the Definitions and Supporting Explanations texts for the F and G categories and align these as much as possible with Extraction projects
- Work out how the Socio-economic E category may be applied and propose text for Definitions and Supporting Explanations
 - How to treat projects that may not generate a positive cash flow
 - How to include any challenges with social acceptance

There's never been a better
time for **good ideas**

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