Application of the UNFC to Injection Projects
Current status and vision for the future

Karin Ask
Equinor
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<td>Mapping UNFC for Injection Projects to the SPE-SRMS</td>
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Injection projects related to geological storage of carbon dioxide ($\text{CO}_2$).

Other injection projects where a fluid is injected into a subsurface geological formation for storage, for example natural gas.
Application of the UNFC to Injection Projects

Working Group members 2018/2019

Karin Ask, Equinor
Michelle S. Bentham, BGS
Maren Bjørheim, NPD
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Wolf Heidug, KAPSARC
Martin Hubbig, OMV
Kris Piessens, Royal Belgian Institute of Natural Sciences
Lesley R. Seldon, Shell
The Specifications for the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Injection Projects for the Purpose of Geological Storage has been available on the UNECE web site since 2016.

[LINK to document on UNFC web site]

No new activity in the working group since last year.
Application of the UNFC to Injection Projects

Examples of possible application presented before

Application of UNFC to Injection Projects - Example 1
Classifying the Snadhvit long term CO₂ solution project

Application of UNFC to Injection Projects - Example 2
The Utstra Formation - Norwegian North Sea

- Statoil and our partners are currently injecting and storing CO₂ at the Steinar field in the southern North Sea
- Feasibility study of full scale CO₂ storage offshore Norway performed in 2016 where a structure in the Utstra Formation was one possible storage site evaluated
- NPD Storage Atlas
- Various studies and publications exist
- Is all of the Utstra Formation a discovered storage resource?

Application of UNFC to Injection Projects - Example 3
EIA Storage Plan – Possible application of the UNFC

Note that this is one possible outcome as seen by the presenter and based on very limited information. The intention is simply to illustrate how the UNFC can be applied.
Application of the UNFC to Injection Projects

Examples of possible application presented before

Application of UNFC to Injection Projects - Example 1

Classifying the *Snøhvit long term CO₂ solution* project

Norwegian classification / Statoil CVP | UNFC as applied to injection projects
--- | ---
| Year | Reporting | Decision gate | Decision stage | Resource class | Sub-class | E | F | G |
| 2011 | RNB2012 | DG1 | Concept planning | C4A | On hold | 2 | 2.2 | 1, 2, 3 |
| 2012 | RNB2013 | DG2 | Definition | C4A | Pending | 2 | 2.1 | 1, 2, 3 |
| 2013 | RNB2014 | DG3 | Execution | C3A | Justified | 1 | 1.3 | 1, 2, 3 |
| 2014 | RNB2015 | DG3 | Execution | C1 | Approved | 1 | 1.2 | 1, 2, 3 |
| 2015 | RNB2016 | DG4 | Operation | C1 | Active injection | 1 | 1.1 | 1, 2, 3 |
Application of UNFC to Injection Projects - Example 2

The Utsira Formation - Norwegian North Sea

- Statoil and our partners are currently injecting and storing CO₂ at the Sleipner field in the southern North Sea
- Feasibility study of full scale CO₂ storage offshore Norway performed in 2016 where a structure in the Utsira Formation was one possible storage site evaluated
- NPD Storage Atlas
- Various studies and publications exist

Is all of the Utsira Formation a discovered storage resource?

<table>
<thead>
<tr>
<th>Project or activity</th>
<th>UNFC as applied to injection projects</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Sub-class</td>
</tr>
<tr>
<td>Sleipner CO₂ storage</td>
<td>Active Injection</td>
</tr>
<tr>
<td>Feasibility Study – Sector structure</td>
<td>Development On hold</td>
</tr>
<tr>
<td>NPD Storage Atlas</td>
<td>Geological Storage Identified</td>
</tr>
<tr>
<td>Various studies and publications</td>
<td>Storage not feasible</td>
</tr>
</tbody>
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Application of the UNFC to Injection Projects

Examples of possible application presented before

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Application of UNFC to Injection Projects - Example 3

EIA Storage Plan – Possible application of the UNFC

<table>
<thead>
<tr>
<th>From EIA Storage Plan</th>
<th>Possible UNFC Classification</th>
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<tbody>
<tr>
<td></td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>G1 x G2 (Bl)</td>
</tr>
<tr>
<td>Project Name</td>
<td>Development Status</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Bobcat Gas Storage Cavern 3</td>
<td>Terminated</td>
</tr>
<tr>
<td>Crowville Salt Dome Project Cavern 2</td>
<td>Operational</td>
</tr>
<tr>
<td>East Cheyenne Phase 2: Lewis Creek Field</td>
<td>Construction</td>
</tr>
<tr>
<td>Golden Triangle Storage Cavern 3</td>
<td>Planned</td>
</tr>
<tr>
<td>Golden Triangle Storage Cavern 4</td>
<td>Planned</td>
</tr>
<tr>
<td>Also Canyon Expansion</td>
<td>On Hold</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 1</td>
<td>On Hold</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 1</td>
<td>On Hold</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 2</td>
<td>On Hold</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 2</td>
<td>On Hold</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 3</td>
<td>Planned</td>
</tr>
<tr>
<td>Magnum Gas Storage Project 1</td>
<td>Planned</td>
</tr>
<tr>
<td>Magnum Gas Storage Project 2</td>
<td>On Hold</td>
</tr>
<tr>
<td>Magnum Gas Storage Project 3</td>
<td>On Hold</td>
</tr>
<tr>
<td>Magnum Gas Storage Project 4</td>
<td>On Hold</td>
</tr>
<tr>
<td>MdS Storage Expansion Project</td>
<td>Construction</td>
</tr>
<tr>
<td>Seneca Lake Gallery 2 Expansion</td>
<td>Terminated</td>
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Note that this is one possible outcome as seen by the presenter and based on very limited information. The intention is simply to illustrate how the UNFC can be applied.
Application of the UNFC to Injection Projects
Current status of application

- The Specifications have been available for some time
- Case studies are so far limited to what has been presented in this forum
- To our knowledge there are no other examples of actual application to injection projects
  - Is UNFC sufficiently known to stakeholders?
    - Limited number of applications also for other commodities
    - If an entity or state is not using UNFC for other commodities, why use it for CCS or Natural Gas Storage?
  - Or is it simply too early?
    - Few examples of portfolios with several storage projects – with one or just a few projects the need for any classification may be limited (at least for CCS)
    - Few or no regulators or regulatory requirements for reporting
Application of the UNFC to Injection Projects
CCS as an integrated part of an energy generation project

- Ongoing and future development and promotion of the UNFC and development of a UNRMS is a step in the right direction
Application of the UNFC to Injection Projects

So what will it take?

- Ongoing and future development and promotion of the UNFC and development of a UNRMS is a step in the right direction
  - Consolidate current developments, making UNFC more suitable for all resources to which it applies
  - Continue to develop and publish case studies including studies across commodities to show the advantage of one integrated system
  - Ensure alignment with other systems. For Injection Projects, possible alignment with the SPE Storage Resource Management System (SPE-SRMS) is an important next step
### Application of the UNFC to Injection Projects

Mapping the UNFC to the SPE-SRMS

- **SPE-SRMS**: Storage Resource Management System
  - Published in 2017, work on guidelines for its application is ongoing
    - Only applicable to CO₂ storage in saline aquifers and abandoned oil and gas reservoirs
    - Both working groups are interested in mapping the two systems
    - Illustration below is from an ongoing attempt by the presenter to evaluate similarities and differences
Thank you

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