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Draft Specifications for Application of UNFC-2009 to Injection Projects

(ECE/ENERGY/GE.3/2016/7)

Presentation to the EGRC 7th Session, Geneva, April 2016

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Background and Mandate

- Mandate from 2013

  The Task Force has been asked to investigate how, for example, oil and gas companies classify and evaluate the maturity of their gas injection projects today, and propose a draft bridging document for application of UNFC-2009 to injection projects, in particular to the storage of carbon dioxide.

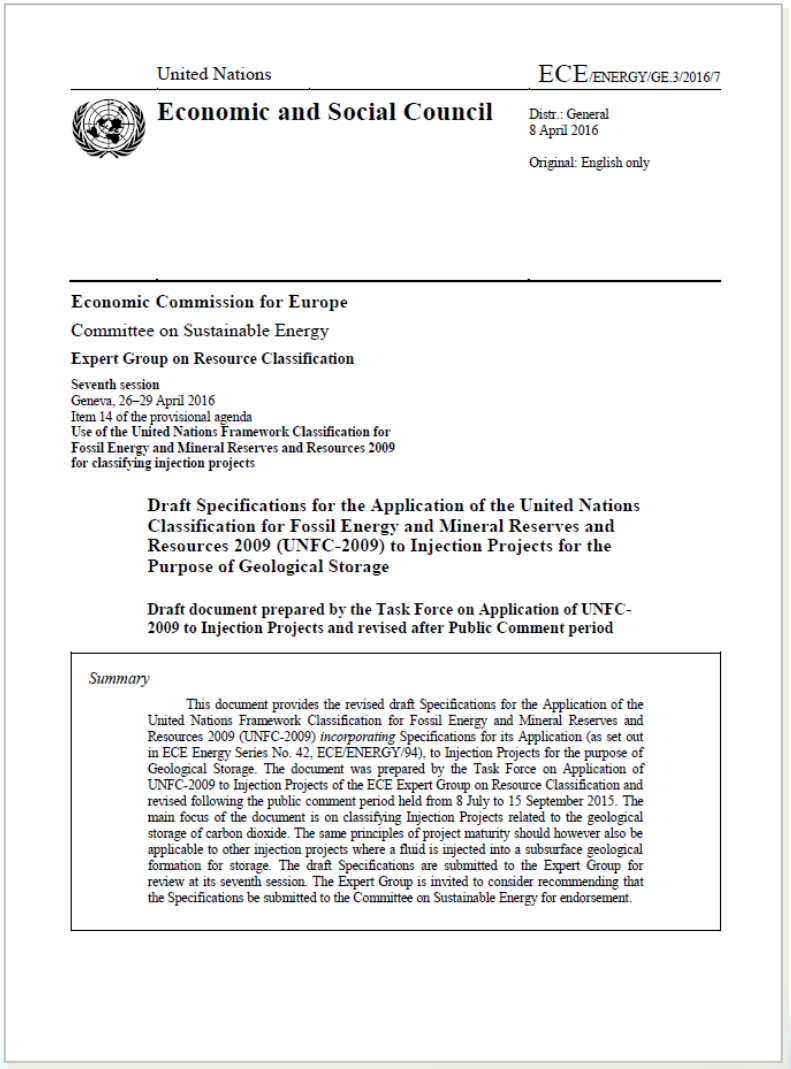
- EGRC recommendation from the 5th session

  The Expert Group recommended that the Task Force on UNFC and Recipient Reservoirs prepare draft specifications for the use of UNFC-2009 to classify injection projects, in particular for the storage of carbon dioxide, and submit them to the sixth session.

- Submission to the EGRC 6th session and Public Commenting

  At the EGRC 6th session, the Task Force presented its proposed DRAFT Specifications for Application of the UNFC to Injection Projects for the Purpose of Geological Storage. These specifications have since been subject to a public comment period and updated based on comments received.

Revised Draft Document Submitted to the 7th Session



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Committee on Sustainable Energy

Expert Group on Resource Classification

Seventh session
Geneva, 26–29 April 2016
Item 14 of the provisional agenda
Use of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 for classifying injection projects

Draft Specifications for the Application of the United Nations Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Injection Projects for the Purpose of Geological Storage

Draft document prepared by the Task Force on Application of UNFC-2009 to Injection Projects and revised after Public Comment period

Summary

This document provides the revised draft Specifications for the Application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) *incorporating* Specifications for its Application (as set out in ECE Energy Series No. 42, ECE/ENERGY/94), to Injection Projects for the purpose of Geological Storage. The document was prepared by the Task Force on Application of UNFC-2009 to Injection Projects of the ECE Expert Group on Resource Classification and revised following the public comment period held from 8 July to 15 September 2015. The main focus of the document is on classifying Injection Projects related to the geological storage of carbon dioxide. The same principles of project maturity should however also be applicable to other injection projects where a fluid is injected into a subsurface geological formation for storage. The draft Specifications are submitted to the Expert Group for review at its seventh session. The Expert Group is invited to consider recommending that the Specifications be submitted to the Committee on Sustainable Energy for endorsement.

DRAFT 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

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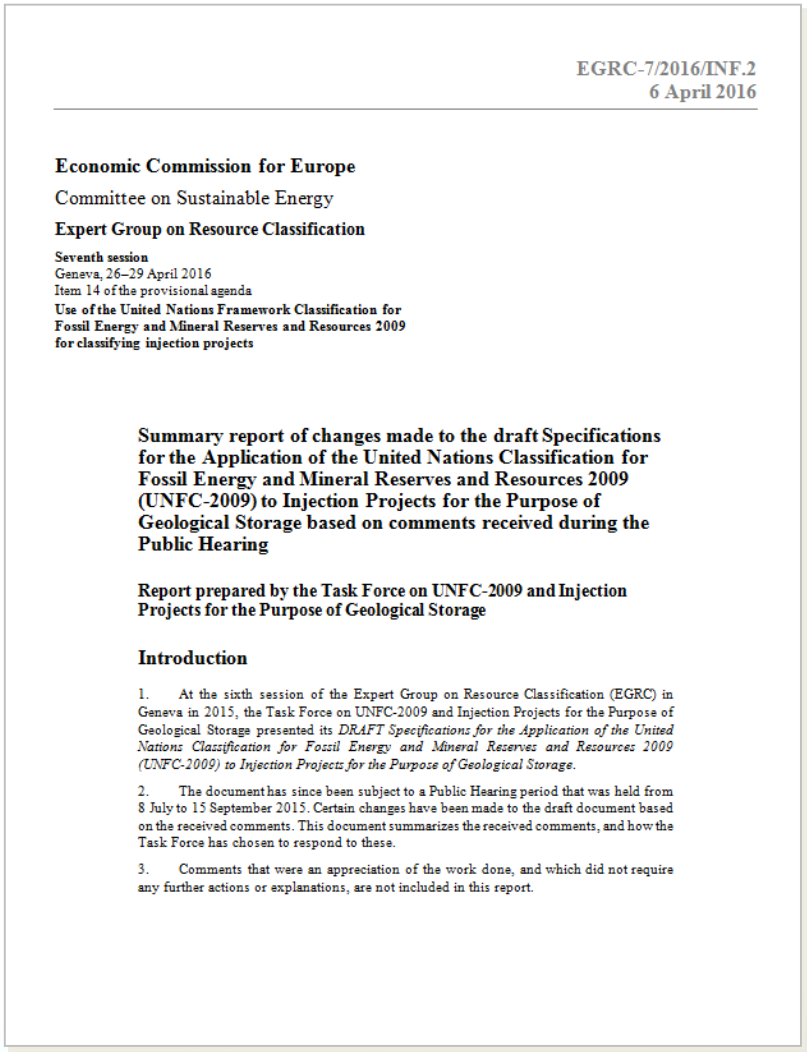
Task Force on Application of UNFC-2009 to Injection Projects

Public Hearing Summary Report



EGRC-7/2016/INF.2
6 April 2016

Economic Commission for Europe

Committee on Sustainable Energy

Expert Group on Resource Classification

Seventh session
Geneva, 26–29 April 2016
Item 14 of the provisional agenda
Use of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 for classifying injection projects

Summary report of changes made to the draft Specifications for the Application of the United Nations Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Injection Projects for the Purpose of Geological Storage based on comments received during the Public Hearing

Report prepared by the Task Force on UNFC-2009 and Injection Projects for the Purpose of Geological Storage

Introduction

1. At the sixth session of the Expert Group on Resource Classification (EGRC) in Geneva in 2015, the Task Force on UNFC-2009 and Injection Projects for the Purpose of Geological Storage presented its *DRAFT Specifications for the Application of the United Nations Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Injection Projects for the Purpose of Geological Storage.*

2. The document has since been subject to a Public Hearing period that was held from 8 July to 15 September 2015. Certain changes have been made to the draft document based on the received comments. This document summarizes the received comments, and how the Task Force has chosen to respond to these.

3. Comments that were an appreciation of the work done, and which did not require any further actions or explanations, are not included in this report.

Summary Report of changes made based on comments received during the Public Hearing.

THANK YOU to all who contributed with comments!

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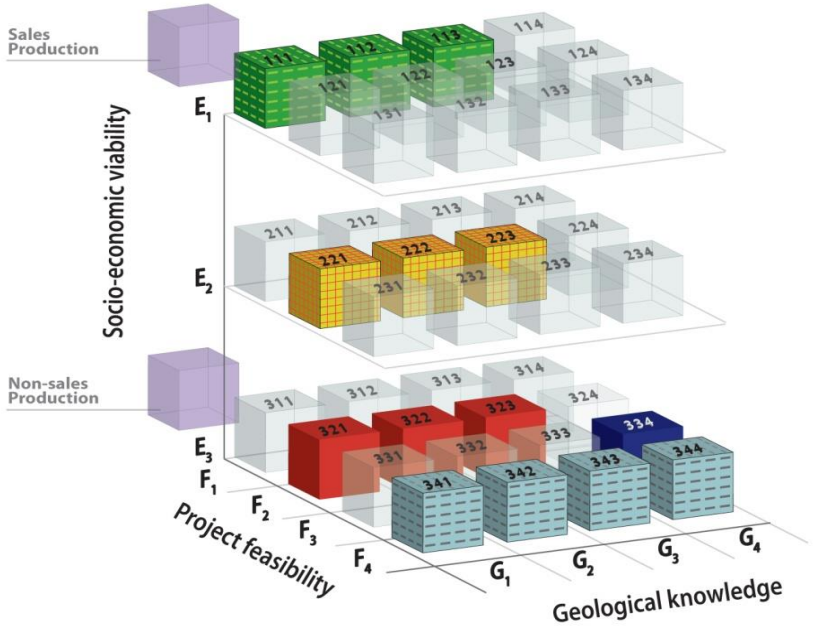
Injection project activities - the simple picture



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

E. Socio-economic viability

F. Project feasibility

G. Geological knowledge

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Important definitions and clarifications

Injection Projects for the Purpose of Geological Storage:

- Geological Storage refers mainly to permanent containment of CO_2 in deep subsurface geological formations
- Same principles can be applied also to other projects through which a fluid is stored in a geological formation (such as hydrogen storage, natural gas storage)

What are we classifying?

- The resource is the available reservoir in which a certain quantity of a given fluid can be stored
- It is not the injected and stored fluid, although this can be a resource in itself
- In the Revised DRAFT document the resource is now referred to as *Geological Storage*

Different Projects – Different Quantities

- Pure storage projects where all we may want to quantify is how much we can store
- Enhanced recovery projects (EOR) where carbon storage may be part of the objective
  - CO_2 injected and extracted (and injected again…)
  - Stored CO_2
  - Extraction project and/or Injection project
- Temporary storage such as underground storage of natural gas
  - Permanent inventory gas (or «cushion» gas)
  - Working gas currently in storage that can be extracted
  - Available storage
    - Decreases as more gas is injected and stored
    - Increases when gas is extracted and sold

Task Force on Application of UNFC-2009 to Injection Projects

UNFC-2009 Main Classes and Categories

UNFC as Applied to Extractive Industries

Total Commodity Initially in Place					
Extracted	Sales Production				
	Non-sales Production				
	Class	Categories			
		E	F	G	
Future recovery by commercial development projects or mining operations	Commercial Projects	1	1	1, 2, 3	
Potential future recovery by contingent development projects or mining operations	Potentially Commercial Projects	2	2	1, 2, 3	
	Non-Commercial Projects	3	2	1, 2, 3	
Additional quantities in place associated with known deposits		3	4	1, 2, 3	
Potential future recovery by successful exploration activites	Explration Projects	3	3	4	
Addtional quantities in place associated with potential projects		3	4	4	

UNFC as Proposed Applied to Injection Projects

Total Geological Storage					
Injected and Stored Quantities					
Lost Quantities					
	Class	Categories			
		E	F	G	
Future storage by commercial injection projects	Commercial Injection Projects	1	1	1, 2, 3	
Potential future storage in known reservoirs by injection projects	Potentially Commercial Injection Projects	2	2	1, 2, 3	
	Non-Commercial Injection Projects	3	2	1, 2, 3	
Storage Not Feasible		3	4	1, 2, 3	
Potential future storage in undiscovered reservoirs by injection projects	Screening Projects	3	3	4	
Storage Not Feasible		3	4	4	

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UNFC-2009 Main Classes and Categories

UNFC as Proposed Applied to Injection Projects					
Total Geological Storage	Injected and Stored Quantities				
	Lost Quantities				
		Class	Categories		
			E	F	G
	Future storage by commercial injection projects	Commercial Injection Projects	1	1	1, 2, 3
	Potential future storage in known reservoirs by injection projects	Potentially Commercial Injection Projects	2	2	1, 2, 3
		Non-Commercial Injection Projects	3	2	1, 2, 3
	Storage Not Feasible		3	4	1, 2, 3
	Potential future storage in undiscovered reservoirs by injection projects	Screening Projects	3	3	4
	Storage Not Feasible		3	4	4

Extracted	⇨	Injected and Stored
Total Commodity Initially in Place	⇨	Total Geological Storage
Potential future recovery	⇨	Potential future storage
Commercial Projects	⇨	Commercial Injection Projects
Additional quantities in place...	⇨	Storage Not Feasible
Exploration Projects	⇨	Screening Projects

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Task Force on Application of UNFC-2009 to Injection Projects

UNFC-2009 Sub-Classes and Categories

UNFC Classes Defined by Categories and Sub-Categories as Applied to Injected and Stored Quantities for the Purpose of Geological Storage						
Total Storage Potential	Injected and Stored Quantities					
	Class		Sub-class	Categories		
				E	F	G
	Known Reservoir	Commercial Injection Projects	Active Injection	1	1.1	1, 2, 3
			Approved for Development	1	1.2	1, 2, 3
			Justified for Development	1	1.3	1, 2, 3
		Potentially Commercial Injection Projects	Development Pending	2	2.1	1, 2, 3
			Development on Hold	2	2.2	1, 2, 3
		Non-Commercial Injection Projects	Development Unclarified	3.2	2.2	1, 2, 3
			Development not Viable	3.3	2.3	1, 2, 3
		Storage Not Feasible		3.3	4	1, 2, 3
	Undiscovered Reservoir	Screening Projects	Storage Potential Identified	3.2	3.1	4
			Storage Potential Indicated	3.2	3.2	4
			Storage Potential Inferred	3.2	3.3	4
		Storage Not Feasible		3.3	4	4

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Definition of Categories – Example E axis

	UNFC-2009	UNFC-2009 applied to Injection Projects for the purpose of Geological Storage	
Category	Definition	Definition	Supporting Explanation
E1	***Extraction and sale*** *has been confirmed to be economically viable.*	**Injection for the purpose of geological storage** has been confirmed to be economically viable [a].	Injection is economic on the basis of current market conditions and realistic assumptions of future market conditions. All necessary approvals/contracts have been confirmed or there are reasonable expectations that all such approvals/contracts will be obtained within a reasonable time frame. Economic viability is not affected by short-term adverse market conditions provided that longer term forecasts remain positive.
E2	***Extraction and sale*** *is expected to become economically viable in the foreseeable future.*	**Injection for the purpose of geological storage** is expected to become economically viable in the foreseeable future.	Injection has not yet been confirmed to be economic but, on the basis of realistic assumptions of future market conditions, there are reasonable prospects for economic injection and storage in the foreseeable future.
E3	***Extraction and sale*** *is not expected to become economically viable in the foreseeable future, or the evaluation is at too early a stage to determine economic viability.*	**Injection for the purpose of geological storage** is not expected to become economically viable in the foreseeable future, or the evaluation is at a too early a stage to determine economic viability.	On the basis of realistic assumptions of future market conditions, it is currently considered that there are not reasonable prospects for economic injection in the foreseeable future; or, economic viability of injection cannot yet be determined due to insufficient information (e.g. during the screening phase).

Generic specifications - Example

- **F. Reference point**

  The Reference Point is a defined location within an injection operation *at which the reported quantities are measured or estimated. The Reference Point may be the* custody transfer point from a pipeline operator to a storage site operator, or the last metered quantity prior to injection*. The Reference Point shall be disclosed in conjunction with the reported quantities. Where the Reference Point is not the point* where custody is transferred to the storage site (or the entity's downstream operations)*, and such quantities are classified as E1, the information necessary to derive estimated quantities shall also be provided.*

Text in *italics* is identical to original UNFC-2009 specifications

Underlined text has been modified to facilitate application to injection projects

Task Force on Application of UNFC-2009 to Injection Projects

Comparing UNFC-2009 with other Proposed Classifications

Extraction Projects								Injection Projects																			
UNFC-2009 defined by Classes, Sub-classes and Categories						PRMS		Techno-economic Resource-reserve Pyramid			CO2CRC Classification (2008)	Classification System proposed by Gorecki et al, SPE126421 (2009)				DOE/NETL Geologic Storage Framework (Adapted PRMS)				CSRCC Frailey & Finley (2009)				Global CCS Institute	
Class	Sub-class	Categories E	F	G				CSLF	CCOP	NPD														Project Status	Project Stage
Commercial projects	On Production	1	1.1	1,2,3	Discovered	Reserves	On Production	Matched Capacity	Operational capacity	Development of Injection Site	Operational Storage Capacity	Theoretical Storage Resource*	Characterized Storage Resource	Effective Storage Resource	Practical Storage Capacity	Commercial	Storage Capacity	Current Injection	Commercial	Capacity	Active Injector	Active	Operate
	Approved for Development	1	1.2	1,2,3			Approved for Development											Approved Injection Project			Under Development		Execute
	Justified for Development	1	1.3	1,2,3			Justified for Development											Planned Injection Project			Planned for Development		
Potentially commercial projects	Development Pending	2	2.1	1,2,3		Contingent resources	Development Pending	Practical Capacity	Contingent Capacity	Suitable for Long Term Storage	Contingent Storage Capacity				Contingent Storage Resource	Sub-Commercial	Contingent Storage	Site Characterization/ Project Pending	Sub-Commercial	Contingent Resource	Development Pending	Planned	Define
	Development on Hold	2	2.2	1,2,3			Developmet Unclarified or On Hold											Site Characterization/ Development on hold			Development on Hold		Evaluate
Non-commercial projects	Development Unclarified	3.2	2.2	1,2,3										Unusable Storage Resource									
	Development Not Viable	3.3	2.3	1,2,3			Development Not Viable											Site Characterization/ Development Not Viable			Development Not Viable		
Additional Quantities in Place		3.3	4	1,2,3		Unrecoverable											Un-Injectable CO2			Unattainable			
Exploration Projects	(No sub-classes defined)	3.2	3	4	Undiscovered	Prospective resources	Prospect	Effective Capacity	Prospective Capacity	Exploration	Prospective Storage Capacity		Uncharacterized Storage Resource			Geologic Storage	Prospective Storage	Site Characterization (Initial)	Undiscovered	Prospective Resource	Propsect		Identify
							Lead											Site Selection			Lead		
							Play											Site Screening (Sub-Regional)			Play		
Additional Quantities in Place		3.3	4	4		Unrecoverable		Theoretical Capacity	Total Pore Volume	Theoretical Volume							Un-Injectable CO2			Unattainable			

- **Techno-Economic Resource-Reserve Pyramid**
  - ***CSLF***
  - ***CCOP***
  - ***NPD***
- **The CO2CRC classification**
- **Classification proposed by Gorecki et al (2009)**
- **The Geologic Storage Framework (US DOE/NETL)**
- **CSRCC (Frailey & Finley, ISGS)**
- **The Global CCS Institute's project overview**

[LINK to document on UNFC web page]

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Examples of Other Ongoing Classification Initiatives

- Shell
- SPE – SRMS Working Group
- Carbon Capture and Storage Association (CCSA) *and* UK CCS Cost Reduction Task Force's Transport and Storage Development Group (TSDG)
- OGCI

Conclusion and Recommendation

The Task Force asks the Expert Group to recommend that the revised draft specifications for the application of UNFC-2009 to injection projects for the purpose of geological storage of CO_2 (ECE/ENERGY/GE.3/2016/7) is accepted and submitted to the Committee on Sustainable Energy for endorsement.

Thank you for your attention!

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