Report of Task Force on Application of UNFC-2009 to Injection Projects

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Task Force on UNFC-2009 and Injection Projects

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High-level mapping

Comparing UNFC-2009 with other proposed classifications

- 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

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																				
	Development Not Viable	3.3	2.3	1,2,3			Development Not Viable								Unusable Storage Resource				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			

Draft document for discussion

- Draft for discussion prepared by the Task Force on UNFC-2009 and Recipient Reservoirs is available as a room document for this meting.

Economic Commission for Europe
Committee on Sustainable Energy
Expert Group on Resource Classification
Fifth session
Geneva, 29 April–2 May 2014
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

ECE/ENERGY/GE.3/2014/INF.2
23 April 2014

Classification of injection projects and possible application of UNFC-2009

Draft for discussion prepared by the Task Force on UNFC-2009 and Recipient Reservoirs

I. Introduction

1. As per the Programme of Work for the Expert Group on Resource Classification for 2013-2014, it was agreed that the Task Force on UNFC-2009 and Injection Projects continue work 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.

2. Bridging Documents explain the relationship between UNFC-2009 and another classification system that has been endorsed by the Expert Group on Resource Classification as an Aligned System. They incorporate instructions and guidelines on how to classify estimates generated by application of that Aligned System using the UNFC-2009 Numerical Codes. The relevant Bridging Document shall be identified when reporting estimates using the UNFC-2009 Numerical Codes.

3. There is currently no universally accepted classification system for injection projects such as carbon storage projects. Mapping the UNFC-2009 directly to an established system for classification of injection projects and using this as basis for a bridging document, is therefore not possible. Several proposals for how to classify injection projects have however been published over the years. A high level mapping of the UNFC-2009 for extraction projects, in its current form, to some of the previously proposed and more widely used systems for classification of geologic storage, is here used to demonstrate that the principles of the UNFC-2009 can be applied also to injection projects.

4. Resource classification is used in the oil and gas industry as well as the mining industry to assess the commercial attractiveness of different extraction projects. Each project is associated with a certain quantity that can be extracted, given a defined technical solution and a certain investment. Projects can be of different size and have different degree of maturity. For injection projects, the resource is defined as the pore space available for storage, rather than the quantity that can be extracted. The activities necessary establish an injection site, are however comparable to those of an extraction project. UNFC-2009 is a principles based system that classifies the maturity of a project activity. Even though it was

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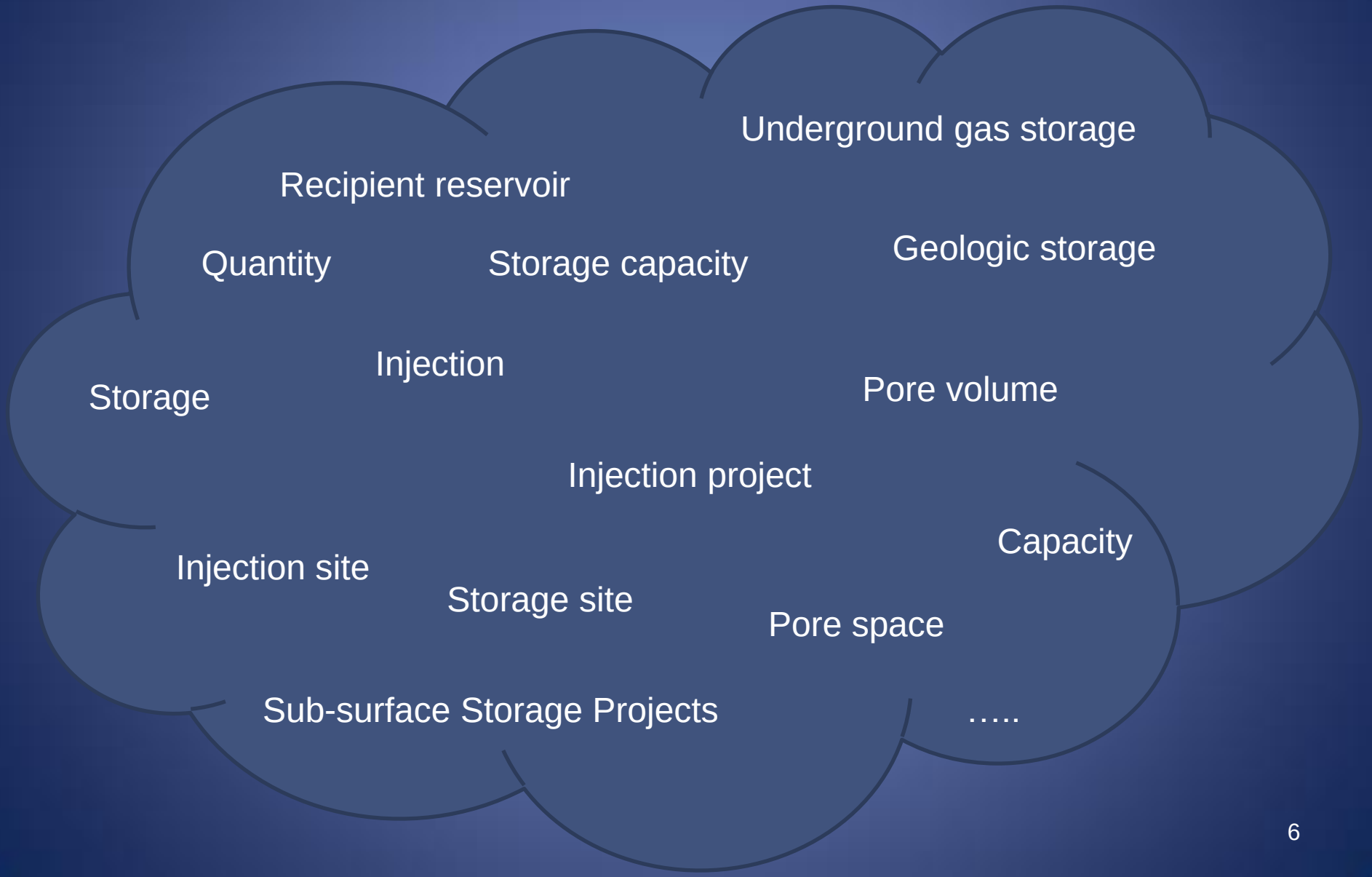
Comparing UNFC-2009 with proposed classifications for injection projects
- Global CCS Institute

Global CCS Institute project overview as of March 2014

											UNFC-2009 Numerical Code				
Name	Region	Stage	Status	Capture type	Transport type	Transport details	Storage type	Storage details	Industry	View	E		F		G
											Category	Sub-Cat	Category	Sub-cat	
Air Products Steam Methane Reformer EOR Project	United States	Operate	Active	Pre-combustion capture (gasification)	Pipeline	Onshore to onshore pipeline 101-150km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Hydrogen Production	view...	1	1.2	1	1.1	
Alberta Carbon Trunk Line ("ACTL") with Agrium CO2 Stream	Canada	Execute	Active	Industrial Separation	Pipeline	Onshore to onshore pipeline 201-250km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Fertiliser Production	view...	1		1	1.2 or 1.3	
Alberta Carbon Trunk Line ("ACTL") with North West Sturgeon Refinery CO2 Stream	Canada	Execute	Active	Pre-combustion capture (gasification)	Pipeline	Onshore to onshore pipeline 201 - 250km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Oil Refining	view...	1		1	1.2 or 1.3	
Boundary Dam Integrated Carbon Capture and Sequestration Demonstration Project	Canada	Execute	Active	Post-combustion capture	Pipeline	Onshore to onshore pipeline 51 - 100km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Power Generation	view...	1	1.2	1	1.2 or 1.3	
Bow City Power Project	Canada	Evaluate	Planned	Post-combustion capture	Pipeline	Onshore to onshore pipeline 51-100km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Power Generation	view...	2 or 3		2	2.2 or 2.3	
C.GEN North Killingholme Power Project	Europe	Evaluate	Planned	Pre-combustion capture (gasification)	Pipeline	Onshore to offshore pipeline 151-200km	Dedicated Geological Storage	Offshore deep saline formations	Power Generation	view...	2 or 3		2	2.2 or 2.3	
Captain Clean Energy Project (formerly Caledonia Clean Energy Project)	Europe	Evaluate	Planned	Pre-combustion capture (gasification)	Pipeline	Onshore to offshore pipeline 351-400km	Dedicated Geological Storage	Offshore deep saline formations	Power Generation	view...	2 or 3		2	2.2 or 2.3	
CarbonNet Project	Australia and New Zealand	Evaluate	Planned	Yet to be decided	Pipeline	Onshore to offshore pipeline 51-100km	Dedicated Geological Storage	Offshore deep saline formations	Not Specified	view...	2 or 3		2	2.2 or 2.3	
Century Plant	United States	Operate	Active	Pre-combustion capture (natural gas processing)	Pipeline	Onshore to onshore pipeline 251 - 300km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Natural Gas Processing	view...	1	1.1*	1	1.1	
Coffeyville Gasification Plant	United States	Operate	Active	Industrial Separation	Pipeline	Onshore to onshore pipeline 101-150km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Fertiliser Production	view...	1	1.1*	1	1.1	
Datang Daqing CCS Project	China	Identify	Planned	Oxy-fuel combustion capture	Pipeline	Onshore to onshore pipeline	Dedicated Geological Storage	Onshore deep saline formations	Power Generation	view...	3	3.2	3		4
Don Valley Power Project	Europe	Define	Planned	Pre-combustion capture (gasification)	Pipeline	Onshore to offshore pipeline 151-200km	Dedicated Geological Storage	Offshore deep saline formations	Power Generation	view...	2		2	2.1	
Dongguan Taiyangzhou IGCC with CCS Project	China	Identify	Planned	Pre-combustion capture (gasification)	Shipping (e.g. tanker/barge/ shuttle)	Ship/Tanker 201-250km	Dedicated Geological Storage	Offshore depleted oil and/or gas reservoir	Power Generation	view...	3	3.2	3		4
Emirates Aluminium CCS Project	Middle East	Evaluate	Planned	Post-combustion capture	Pipeline	Onshore to onshore pipeline 351-400km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Power Generation	view...	2 or 3		2	2.2 or 2.3	
Enid Fertilizer CO2-EOR Project	United States	Operate	Active	Industrial Separation	Pipeline	Onshore to onshore pipeline 201-250km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Fertiliser Production	view...	1	1.1*	1	1.1	
ESI CCS Project	Middle East	Execute	Active	Industrial Separation	Pipeline	Onshore to onshore pipeline <50 km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Iron and Steel Production	view...	1	1.1*	1	1.2 or 1.3	
FutureGen 2.0 Project	United States	Define	Planned	Oxy-fuel combustion capture	Pipeline	Onshore to onshore pipeline <50 km	Dedicated Geological Storage	Onshore deep saline formations	Power Generation	view...	2		2	2.1	
Gorgon Carbon Dioxide Injection Project	Australia and New Zealand	Execute	Active	Pre-combustion capture (natural gas processing)	Pipeline	Onshore to onshore pipeline <50 km	Dedicated Geological Storage	Onshore deep saline formations	Natural Gas Processing	view...	1	1.2**	1	1.2 or 1.3	
Great Plains Synfuel Plant and Weyburn-Midale Project	Canada	Operate	Active	Pre-combustion capture (gasification)	Pipeline	Onshore to onshore pipeline 301 - 350km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Synthetic Natural Gas	view...	1		1	1.1	
Huaneng GreenGen IGCC Project (Phase 2)	China	Evaluate	Planned	Pre-combustion capture (gasification)	Pipeline	Onshore to onshore pipeline 51-100km	Enhanced hydrocarbon recovery	Use of CO2 in enhanced oil recovery	Power Generation	view...	2 or 3		2	2.2 or 2.3	

Terminology…



UNFC-2009 Application to Injection Projects
Sub-classes Defined by Categories

UNFC-2009 for Injection Projects				
UNFC2009 - Prposed Application to Injection Projects such as CO_2 Storage Projects				
Class	Sub-class	Categories		
		E	F	G
Commercial Storage 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 Storage Projects	Development Pending	2	2.1	1, 2, 3
	Development on Hold	2	2.2	1, 2, 3
Non-Commercial Storage Projects	Development Unclarified	3.2	2.2	1, 2, 3
	Development not Viable	3.3	2.3	1, 2, 3
Storage Unattainable		3.3	4	1, 2, 3
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 Unattainable		3.3	4	4

Sub-classes and Categories shown here are the same as those used for Extraction Projects.

Thank you for your attention

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