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Expert Group on Resource Classification

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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.

Comments received with actions and responses

4. Below is a summary of the comments that required either that the current draft text be updated, to clarify or improve the proposed specifications, or that an explanation was provided as to why such an update was not considered necessary. The comments are quoted directly from the web site in the order that they were published, and responses from the Task Force are provided for each comment.

Comments from Mr. M. K. Hamdan at PTTEP

i) Para 28 : *The "Development Plan" for injection projects usually ties in to a broader development scheme, where there are also production fields (source of gas) and injection site. Hence, when discussing about the "Development Plan", it is not clear in the paragraph whether it is just for the injection site, or the entire project as a whole. Economic evaluation just for injection site, can happen by itself but typically associated with the bigger development scheme - capture and injection.*

Task Force response: The specifications have been developed primarily with the development of an injection or storage site in mind. However, the principles should be applicable also to an integrated project, including capture and transportation of the fluid that is to be stored. The text defining the Development Plan has been updated to make this clearer.

ii) *Annex I. Porosity - The ratio of aggregated volume of interstices in a rock to its 'total' volume....*

Task Force response: The word "total" has been added to the text as proposed.

iii) *Reservoir - A subsurface body of rock with sufficient porosity and permeability to store and transmit fluids, and characterised by a single pressure system.*

Task Force response: The Task Force believes the storage reservoir would not necessarily be characterised by a "single" pressure system, and has instead proposed to add "... and characterised by a hydraulically connected pressure system".

Comments from Mrs. Cristelle Nikoh Mefegueng, Inspector of Petroleum Products, Department of Petroleum Products and Gas, Ministry of Water and Energy of Cameroon

i) *Page 15, K. 53., Aggregation of Quantities: which makes emphasis on giving a proper justification and disclosure of the methodology adopted for the aggregation of estimated quantities associated with injection projects and geological storage operations classified in different Categories on the E or F axis.*

Task Force response: This comment is merely stating that this is an important aspect to consider when applying the classification. No further Task Force action was required.

ii) *Page 16. T. 64, on Quantities delivered for injection and storage that may not be stored: losses or leaks in transportation is an important aspect to consider.*

Task Force response: Losses and leaks have now also been included in Figures 1 and 2, which shows the abbreviated version with primary classes and the subclasses

as defined by sub-categories. A reference to these figures is included in item T. *Quantities delivered for injection and storage that may not be stored* in the Generic specifications. Please also refer to Comment # 1 from Mr. Sigurd Heiberg below on lost quantities.

Comment from Mr. Frantz May at the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Germany

i) *The concept of "foreseeable future" is a vague one, leaving too much room for speculations. It should be tried to define it, providing a time scale depending on past market developments or market cycles, if available. So that examples of orders of magnitude can be given.*

Task Force response: What the "foreseeable future" is may vary considerably between different projects, sites, countries, reporting purposes etc. It is therefore deliberately not defined to be a specific number of years in UNFC-2009. However, the Task Force is proposing to define the foreseeable future for injection projects for the purpose of geological storage as: "*Time frame within which an injection project for the purpose of geological storage has reasonable prospects for becoming technically and commercially feasible*".

Comments from Mr. Anthony Budd, Geoscience Australia

i) *In Part III/A Geological storage, the commentary infers that all storage projects will be conducted in depleted petroleum reservoirs. This may be so for most, but perhaps not all projects.*

Task Force response: The draft text briefly describes several different types of storage, some of which refer to depleted petroleum reservoirs including storage as part of increased hydrocarbon recovery projects. However, the only part of the text that specifically mentions different types of storage reservoirs is found under the part about underground natural gas inventory. In order to clarify that geological storage can be conducted in different types of reservoirs, the Task Force has proposed to include a short sentence in the first paragraph stating that the reservoir used for storage can be (but is not limited to) "*...for instance a depleted oil and gas reservoir or a saline aquifer*".

ii) *In Part III/F Project Life Time identifies that injection projects (CO₂ specifically) need to include activities after the active injection. Perhaps allowance for this needs to be included in Supporting Explanations for the economic (E1, E2) definitions (e.g. Table 1).*

Task Force response: Text has been added to (a) Injected and stored quantities under Figure 1 to allow for this.

Comments from Mr. Radoslav Vukas and Mrs. Ana Dajović, Ministry of Mining and Energy, Republic of Serbia

i) *III. Injection projects definitions; A. Geological Storage, point 16 (page 5): In the text, after phrase: ... Deep subsurface geological formations; and in brackets, enter (about 1 km or more).*

Task Force response: The Task Force believes we should avoid limiting the application of the classification to storage only below a certain depth. In order to avoid speculations as to what constitutes a “deep” subsurface geological formation, the proposal is to rather remove the word deep and limit the text to “...*permanent containment of carbon dioxide (CO₂) in subsurface geological formations.*”

ii) *In part B. Defining the Project (page 6) are the terms the Injection Storage project and the project, but in Annex I (Glossary of Terms: page 19), there is no definition of the term Storage project. May be need added definition for the “Storage project”.*

Task Force response: The Task Force has chosen to change the text in *B. Defining the Project* to only use the terms “Project” and “Injection Project” in order to avoid confusion.

iii) *In Part F. Project Life Time (page 8), may be need to add life in years, if it is possible.*

Task Force response: The Task Force believes we should avoid specifying time in years as this may vary considerably between injection projects and also depend on for what purpose the classification is used. A future regulator may wish to specify this for a specific reporting, but it should not limit how and when the classification can be applied. No changes have therefore been made to the Draft specifications.

iv) *In part M. Evaluator Qualifications (page 14), may be add after: Evaluator must possess, adequate / specific academic qualifications.*

Task Force response: The current wording is identical to that of the Generic Specifications to the UNFC-2009 as applied to extractive activities, except the word “deposit” has been replaced by “reservoir”. It is assumed that any person, or persons, that apply the classification, do have adequate qualifications, both academic and other, to evaluate the feasibility of the relevant injection project. However, as also pointed out by other commenters, the current wording only refers to “*appropriate level of expertise ...with the type of reservoir under evaluation*” and makes no mention of the type of project. The Task Force has therefore chosen to changes this to “*..with the type of reservoir and injection project under evaluation.*”

v) *In Annex I, it might be needed to add definitions for: Local Geological Study; Regional Geological study, Pilot studies and Development Plan.*

Task Force response: *Development Plan* is already defined in Part III *Injection project definition (item E.)* The terms *Local Geological Study, Regional Geological Study and Pilot Studies* are used also in the original UNFC-2009 documentation for extraction projects, without any specific definition. These are terms that should be well known to all experts working with geological studies for different purposes, and the Task Force does not believe it is necessary to define these further for application to injection projects for the purpose of geological storage. No changes have been made to the Draft document.

Comments from Professor Marinela Panayotova, University of Mining & Geology, Bulgaria

i) 26. ... *How much of the Total Storage Potential initially in place that will eventually be utilized for geological storage, will depend on the specifics of the individual projects that are classified.*

Task Force response: Corrected

ii) 27.....*The quantity stored in one reservoir may be the aggregated quantities from several sources, from one single source or part of the total quantity from one source, and vice versa.*

Task Force response: The term “*..and vice versa*” was originally added to indicate that quantities from one source may also be stored in more than one reservoir. This situation is however already covered by the wording “*...or part of the quantity from one source*”. The Task Force agreed to remove “*..and vice versa*” from the Draft as suggested.

iii) 28. ... *The design elements should include well locations, completion techniques, drilling methods, site facilities (as needed), transportation, and the source **and type** of injection fluid.*

Task Force response: The text has been changed to “*.. and the source and type of injection fluid*” as proposed.

iv) 30. *An injection project will need to include activities also after the active injection has ceased, such as monitoring of any fluid movements and making sure that there is reasonable confidence that the injected fluid is retained in the reservoir. How this will affect the total life time of the project will depend on the specifics of the project, the reservoir, the injected fluid and the prevailing **technological and legal** rules and regulations.*

Task Force response: What type of regulations that may be relevant has deliberately not been specified, in order not to rule out any type of regulation that may be applicable either now or in the future. The Task Force prefers to leave this open and has decided not to include the proposed change in the Draft.

v) *Reservoir A subsurface body of rock with sufficient porosity and permeability to store and transmit fluids, **which are confined in the reservoir.***

Task Force response: The Task Force believes the current definition is sufficient as it includes the term “*...to store...*” which implies that the injected fluid will remain in the reservoir once injected. No changes have been made to the text in the revised draft.

Comments from Mr. Sigurd Heiberg, Petronavit, Norway

i) *The ones of more principal importance concern figures 1 and 2, where it is vital to translate table 2 and 3 of UNFC 2009 fully, including a class of lost quantities that in the text have been well defined to replace non-sales production, and the footnotes. In particular, it is important to preserve the ability of the UNFC to distinguish between E and F contingencies, meaning that projects may be E1 but not technically ready for implementation (F2) or E2 and F2 as noted in the figures. The former will naturally occur if there is a sweeping change of frameworks affect more projects than industry has the capability to follow up immediately.*

Task Force response: Lost quantities (losses and leaks) have now been included in Figures 1 and 2, as also mentioned above. A reference to these figures is included in item T. *Quantities delivered for injection and storage that may not be stored* in the Generic specifications. All footnotes in figures 2 and 3 of the UNFC-2009 that are relevant for injection projects for the purpose of geological storage, have been included in figures 1 and 2 in the Draft, with minor adjustments where necessary.

ii) *A second principal concern is the definition of the basis of the estimate, whether it is the project quantities or the quantities corresponding to the economic interests of the reporter. The project quantities are always defined and must be estimated. Appropriation of those quantities to project participants may or may not be directly related to the project. They often are, but the participants are generally free to agree or legislate otherwise, and sometimes do. In order not to lose the project definition, it is important to insist that project quantities are estimated. Reporters will generally be free to disclose or not information they own including project estimates and appropriations, unless required to do otherwise. This is not an issue of classification, but of management.*

Task Force response: As Mr. Heiberg points out, this is not a classification issue but rather an evaluation and/or reporting issue, and UNFC as a classification should be applicable both to full project quantities and to quantities representing the economic interest of the reporter. No changes have been made to the Draft document.

iii) *A third principal concern is the evaluator qualifications. The basic principle here must be that numbers be correct. When they depend on other than geological conditions, the evaluator must be qualified to assess also those.*

Task Force response: As also pointed out by other commenters, the current wording only refers to “*appropriate level of expertisewith the reservoir under evaluation*” and makes no mention of the type of project. The Task Force has therefore chosen to change this to “*..with the reservoir and type of injection project under evaluation*” as suggested.

In addition to the comments above, Mr. Sigurd Heiberg kindly submitted a copy of the Draft document with several proposals for minor changes included in track changes mode. Most of these were good proposals that made the document clearer, but had no major effect on the actual application of the classification. They have been included in the revised Draft but are not discussed in detail in this summary report.

Comments from Statoil, Norway

i) *Using and adapting the UNFC-2009 for Injection projects is a good approach and connects the different areas in a good way. It is however just beginning to set out the framework for storage. This is done in parallel to many other activities. Since this is an area under development the document should stay in “evolutionary” and “advisory” mode and recognize that the topic of regulating geological storage is maturing in numerous domains globally (EU-directive, US-EPA and other national and international efforts). Here ISO should be mentioned especially. The latter also leads to the subject of EOR mentioned in III A-20. It is a demanding task to include CO₂EOR as part of a storage activity. There are lots of legal issues to be addressed, but CO₂EOR can act as an enabler for the*

infrastructure and economic viability of a storage project and thus fit into the categories described in the document.

Task Force response: The purpose of publishing these specifications for application of UNFC-2009 is simply to specify how the UNFC-2009 shall be understood and applied if and when it may be used to classify injection projects. The Task Force fully recognises that the topic of regulating geological storage is still in an early phase and subject to continuous maturation. However, the classification is not a regulation in itself. Using this classification (or any other classification) is not mandatory until a regulator, or any other party, chooses to make it so for their purpose, in which case these specifications must be followed.

Concerning ISO, members of the Task Force are also involved in the ISO work groups that are now looking in to several issues related to regulation of Carbon Capture and Storage. Project maturity classification is however not part of this work today.

No changes have been made to the Draft document based on this comment, but the Task Force should continue to follow the work done by ISO and others.

ii) *Reference to the footnote p3: “There is currently a lack of consensus in the Task Force on UNFC-2009 and Injection Projects for applying the term Storage Potential to all injection projects, including the most mature projects. The Task Force is continuing its work on finding an alternative term that better describes all levels of project maturity”. Since the term “storage potential” is already much debated, we are concerned that including hydrogen and gas storage in the same definition as CO2 storage potential could be tricky. Our advice would be to defer this discussion until the technology is more mature, and rather to focus on stimulating pilot and demonstration geological storage projects to promote maturation of this technology globally.*

Task Force response: The Task Force agrees that stimulating pilot studies and demonstration projects to mature geological storage technology globally is important and should be focused on. In fact, the only way we can test the UNFC, or any classification system proposed applied to such projects, is by applying it in ongoing studies and projects. By doing this, we can evaluate the application over time and improve the classification going forward. No changes have been made to the Draft based on this comment.

Comments from Ms. Lesley Seldon, Reservoir Engineer EOR Deployment, Shell

i). *There is a mixed message between table 1 definition for ‘E1’ which says that all necessary approvals/contracts have been confirmed or there are reasonable expectations that all such approvals will be obtained vs p8 (H.34.) which says that in order for an injection project to be classified as economically viable all required storage permits or other relevant permits must be in place. The issue of permits and licencing has been something I have struggled with a lot in my efforts to write internal guidelines for Shell – reasonable expectation is normally enough in the petroleum world although that is based on historic experience of obtaining permits for other projects.*

Task Force response: In the revised Draft, the text referred to in H.34 has now been changed to match the text in the table 1 definition for E1. The wording “..or

there are reasonable expectations that...” is in line with the original definition of E1 in the UNFC for fossil energy and mineral reserves and resources, and the proposal is that this is not changed.

ii) *Is it worth adding into section on units that CO2 storage resources are typically quoted in terms of mass rather than volume? This was a question from the EGRC meeting. Or do we assume that everyone who works in storage projects knows this already. Also I think that ideally the composition of the storage gas should be given with the storage capacity estimate. If the composition changes then the capacity will also change.*

Task Force response: Mass versus volume has previously been discussed several times by the Task Force, and the conclusion was to avoid using both words and rather just refer to “quantities” stored. There is however no harm in stating that for carbon dioxide the quantity is typically quoted in mass. A comment to this effect has been added to the definitions under *D. Quantities Stored*.

Conclusion and recommendations

5. The Task Force proposes that the document *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*, which has been updated and improved based on the comments received through the Public Comment, is put forward for review by the Technical Advisory Group (TAG), recommendation by the United Nations Economic Commission for Europe (UNECE) Expert Group on Resource Classification and subsequent approval by the UNECE Committee on Sustainable Energy.
