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Use of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) for classifying injection projects

Interim report by the Task Force on UNFC and Recipient Reservoirs

I. Introduction

1.   The Programme of Work for the Expert Group on Resource Classification for 2009-2010 included an agreement to explore how the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) could be used in classifying injection projects, such as natural gas storage, CO_2 storage or other waste disposal projects. Ms. Karin Ask, Vice Chair of the Bureau of the Expert Group on Resource Classification, volunteered to coordinate this work.

2.   At the first session of the Expert Group on Resource Classification, an introduction to the challenges posed by these kinds of projects was presented. The presentation focused on CO_2 injection for long-term storage in different geological media. Further work since this session has focused mainly on identifying other systems proposed used for classification of injection projects or recipient reservoirs.

3.   The Task Force on UNFC and Recipient Reservoirs will continue to look into if and how UNFC-2009 can be applied to these kinds of projects.

II. Background

4.   UNFC-2009 applies to fossil energy and mineral reserves and resources located on or below the Earth's surface. It has been designed to meet, to the extent possible, the needs of applications pertaining to energy and mineral studies, resources management functions, corporate business processes and financial reporting standards.

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5.   UNFC-2009 is a generic principle-based system in which quantities are classified by projects on the basis of the three fundamental criteria of economic and social viability (E), field project status and feasibility (F), and geological knowledge (G), using a numerical coding system. Combinations of these criteria create a three-dimensional system. Categories (e.g. E1, E2, E3) and, in some cases, sub-categories (e.g. E1.1) are defined for each of the three criteria.

6.   A full description of the UNFC-2009 system can be found in the United Nations Publication "United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009" (ISSN 1014-7225, The ECE Energy Series No. 39).

7.   Other systems have been proposed for use in classifying in particular CO_2 storage sites or projects. To date, no system has however been universally accepted as an established system for classification of injection projects.

III. Mandate

8.   As per the Programme of Work for the Expert Group on Resource Classification for 2010-2011, it was agreed subject to appropriate prioritization, that the Task Force on UNFC and Recipient Reservoirs (established by and reporting to the Bureau) should continue to develop its views on this potential use of the UNFC and identify additional key stakeholders who could provide critical analysis and feedback on the practicality of applying UNFC-2009 for these types of projects;

IV. Membership

9.   The Task Force on UNFC and Recipient reservoirs currently has three members; Ms. Karin Ask (Statoil), Ms. Eva Halland (Norwegian Petroleum Directorate) and Mr. Martin Hubbig (RWE Dea AG).

V.   Findings to date

10.   Injection projects have many challenges, some of which are similar to oil and gas extraction projects, while others are specific to injection projects in general or to the site or project in question. There are risks associated not only with the actual injection activity, but also with the long-term development in the storage reservoir post injection. This is particularly true for long-term storage projects such as CO_2 storage, where the risk of leakage is a consideration.

11.   If a reservoir is used for receiving gas for temporary storage, there may be a need for a classification of the reservoir both as an injection and a production project. If gas is injected into an oil or gas reservoir containing indigenous gas, and where both injected and indigenous gas will be produced, there may not be a way to distinguish physically what part of the produced gas is injected and what is indigenous gas.

12.   Different stakeholders and potential user groups will have different expectations. For a simple injection project, classification of the different project activities and their maturity may be sufficient. However, some stakeholders may expect a system that classifies the actual recipient reservoirs and which can be used for instance for screening potential CO_2 storage sites worldwide. This may require a very different approach, assessing potential projects at a very immature stage.

13.   Most attempts at classifying injection projects that have been made so far focus on carbon capture and storage (CCS) projects and disposal of CO_2 by injection in to some kind of geological media for long-term storage. Some of these attempts are based on existing systems currently used for classifying resources and reserves within the oil and gas industry, such as the Society of Petroleum Engineers (SPE)/World Petroleum Council (WPC)/American Association of Petroleum Geologists (AAPG)/Society of Petroleum Evaluation Engineers (SPEE) Petroleum Resource Management System (SPE-PRMS). Proposals for how to calculate so called storage coefficients, for determining how much CO_2 that can potentially be stored in different geological formations, or in a specific injection site, have also been published by different authors and organizations. Proposed classifications are sometimes linked to these storage coefficient calculations.

14.   Examples of other classification systems that have been proposed are:

        (a)   The Techno-Economic Resource-Reserve pyramid proposed by the Carbon Sequestration Leadership Forum (CSLF) (CSLF, 2007);

        (b)   The CO2CRC classification system for CCS (CO2CRC, 2008);

        (c)   A proposal for "A New Classification System for Evaluating CO_2 Storage Resource/Capacity Estimates" was presented at the 2009 Society of Petroleum Engineers (SPE) International Conference on CO_2 Capture, Storage and Utilization (SPE, 2009); and

        (d)   The United States Department of Energy (US DOE) has proposed to use a so called Geologic Storage Framework, which is also an adaptation of the SPE-PRMS for classification of CO_2 injection projects. This is briefly described in the 2010 edition of the Carbon Sequestration Atlas and is also included in presentations and publications by the National Energy Technology Laboratory (NETL).

15.   As these systems are developed primarily with permanent CO_2 storage in mind, they do not account for possible future extraction of the stored gas, or for the challenges in keeping a correct inventory when gas is injected into an oil or gas producing reservoir. Some seem to mainly focus on larger scale inventory purposes, while others are more project-oriented.

16.   Some of these systems make a clear distinction between a *storage resource* and *storage capacity*. A resource is defined as the available pore volume that may potentially be used for storage, whereas the word capacity is used once technical and economic constraints have been applied.

17.   UNFC-2009 classifies resources on the basis of the characteristics of the projects that will recover them. These characteristics will be largely the same for projects that inject material into recipient reservoirs. In the simplest case, where a reservoir is used to receive matter and store it, such as CO_2 storage, it may appear that the UNFC logic can be turned around and used with limited modification. The same approach has been used in the Geologic Storage Framework, where the SPE-PRMS has been adapted for similar use.

VI. Future work orientation

18.   The Task Force on UNFC and Recipient Reservoirs proposes to continue the work looking into the following:

        (a)   Who are the stakeholders and what are their expectations? The Task Force should identify the main stakeholder groups and clarify what the needs and expectations of these different groups are.

(b)   What systems are currently used in evaluating possible injection projects? In addition to the systems mentioned in this report, other systems are probably used, for instance by oil and gas companies that are currently injecting gas for temporary or long-term storage. What can we learn from their experiences?

(c)   Review of the Underground Gas Storage Study prepared by the United Nations Economic Commission for Europe (UNECE) Working Party on Gas and consideration of the relevant elements therein for developing an applicable classification.

(d)   Based on these findings, how would the Task Force propose to adapt the UNFC-2009 for use on injection projects?

19.   As mentioned, a simple approach could be to simply turn the system around and change the terminology slightly, thus classifying the project activities in a manner similar to classification of oil and gas extraction projects. This approach will, however not address the challenges posed by projects with both injection and reproduction of stored volumes. Here the need for reflecting the physics of the processes must be considered carefully. Simply reversing UNFC-2009 may make the reversed system less useful for national or worldwide inventories of potential storage sites. Finally, as the economic incentives for some of these projects are still uncertain, and different to that for extraction projects, the distinction made in UNFC-2009 between economic viability (E) and technical feasibility (F) may prove to be highly valuable.