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Harmonization of Fossil Energy and Mineral Resource Classifications

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Sub-soil assets subgroup issue paper prepared by:

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Harmonization of Fossil Energy and Mineral Resource Classifications

1. Issue to be addressed:

The issue to be addressed is the definition of physical reserves for subsoil assets, to be considered in the revision of chapter 8 (Specific Resource Accounts) in the SEEA-2003 manual.

The definition of physical reserves for subsoil assets is included as an issue to be addressed on short term both by:
- o   Subgroup on Mineral and Energy accounts (Preliminary list of issues to be dealt with concerning Mineral and energy Accounts. Issue 1) and
- o   UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) (Research agenda, a preliminary consolidated list of issues. Issue 11).

2. Executive summary

Currently the SEEA-2003 manual does not discuss in detail the different classification systems used by countries with regards to the physical amounts of oil and natural gas resources. To a large extent the manual takes the existence of the physical assets as a "given" and then focuses on different ways to calculate the value of the assets.

The main shortcoming with this assumption is that there are many different classification systems that are used by different countries. If a goal is to have comparable international statistics on subsoil assets then there needs to be a consistent starting point for making the valuation calculations.

Since the publication of the SEEA-2003 manual, a new UN Framework Classification (UNFC) for subsoil assets has been developed. This new classification system has three-dimensions or criteria: economic and commercial viability (E), field project status and feasibility (F) and geological knowledge (G). This 3-dimensional system is further specified into categories which define areas that are named by their coordinates. The system is defined so that each cell has a unique coordinate name and location which eliminates the problem of often imprecise descriptive names such as "proven reserves" or "probable reserves" which can have different definitions in country specific classification systems.

The new guidance manual on subsoil assets should take the developments of the UNFC into account and it is recommended that the UNFC system needs to be the starting point for determining which categories of the physical assets should be included in the valuation calculations. It is further suggested that experts from the UNFC need to be consulted regarding which of the assets should be included before the London Group can make their final recommendations for valuation calculations in the new manual for sub-soil assets.

3. Description of the issue and current situation with respect to the treatment in the SEEA and SNA, country practices, alternative treatments and solutions to the issue

Each of these different topics will be addressed separately in the following sections.

3. 1 Description of the issue

Currently the SEEA-2003 manual does not discuss in detail the different classification systems used by countries with regards to the physical amounts of oil and natural gas resources. To a large extent the manual takes the existence of the physical assets as a "given" and then focuses on different ways to calculate the value of the assets. The main shortcoming with this assumption is that there are many different classification systems that are used by different countries.

Different definitions of the physical resources then mean that there is not a consistent starting point for making the valuation calculations.

Changes in the classification of physical assets can have an impact on the values of the oil and gas resources. An example of the importance of the classification of assets was shown when the Royal Dutch and Shell companies reclassified 4.47 billion barrels of oil equivalent or approximately 23 percent of previously reported "proved reserves", because they were not proved reserves as defined by applicable Securities and Exchange Commission law (see for example U.S. District Court complaint H-04-3359). This resulted in a decrease in the stock price particularly on January 9, 2004 and throughout the period until May 24, 2004.

Although this is an example from a specific enterprise the same situation could potentially occur for a country's subsoil asset evaluation if the assets are classified in a new way or if different portions of the classification are included in the valuation calculations.

3.2 Treatment in the SEEA-2003

The general principles of physical and monetary mineral and energy resource accounts are discussed in chapters 7 and 8 of the SEEA-2003 manual. A single agreed approach could not be reached for all issues, and in these cases, various options on how to compile accounts are given.

The treatment given in the SEEA-2003 manual on the classification of subsoil assets in physical units is not given in a way to secure harmonization among countries in the classification of reserves of oil and gas. There is room for interpretations of how to classify reserves of oil and gas, which also applies to the question regarding what type of reserves to include and exclude in the monetary assets accounts for oil and gas.

The SEEA manual refers primarily to the McKelvey diagram which classifies the physical assets primarily in two dimensions, feasibility of economic recovery and degree of certainty. These two dimensions are further divided into categories:

Degree of certainty:
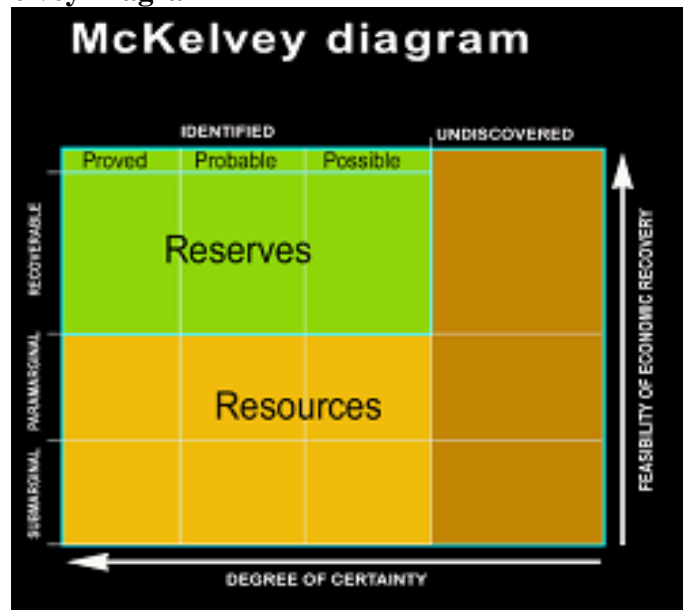   1. identified
         a. proved
         b. probable

          c. possible
   2. undiscovered

Feasibility of economic recovery
   1. recoverable
   2. para-marginal
   3. sub-marginal

The following figure shows the McKelvey diagram and the relationship between the different areas.

Figure 1: The McKelvey Diagram

Although this is the classification system referred to in the SEEA-2003 manual, it is not used by all countries. Converting country systems to the McKelvey system requires interpretations to be made by each country, which may not be made in a consistent or comparable way.

3.3 Description of selected country practices

Both Eurostat and the London Subgroup on Mineral and Energy Accounts have undertaken surveys of country practices regarding the compiling of mineral and energy asset accounts. In 2002 Eurostat issued detailed tables/guideline on Natural Resource Accounts for Oil and Gas (Eurostat, 2002), that presented the results of Eurostat's first regular collection of subsoil accounts for oil and gas from countries in the European Economic Area.

When Eurostat collected subsoil asset accounts data for oil and gas, information regarding the data sources and reserve definitions was obtained from the countries. This information is presented in the following table and shows the variation regarding the treatment of the various asset categories used by countries when asked to report this information in a questionnaire. The McKelvey classifications were used for reporting to the questionnaire.

Table 1: Sources and definitions for oil and gas reserves from Eurostat's first collection of subsoil accounts for oil and gas from countries in the European Economic Area.

Country	Source of reserve data	Reserve definitions		Physical stock used in stock value estimates	Follow SEEA or SNA?
		Discovered reserves	*Undiscovered reserves*		
Denmark	Danish Energy Agency	The sum of the expected proven, probable and possible reserves	No data available	Discovered reserves	SEEA
Germany	Niedersächsisches Landesamt für Bodenforschung	The un-weighted sum of proven and probable reserves	No data available	no information available	no informa-tion
France	Secrétariat à la Conservation des Gisements d'Hydrocarbures, Ministère de l'Industrie	Includes proven reserves only	No data available	Proven reserves	SNA
Nether-lands	Netherlands Ministry of Economic Affaires	Remaining expected reserves	Future additions to natural gas reserves as a result of exploration	Estimated based on government appropriation of resource rent. ¤	unclear
Austria	Austrian Geological Survey, extraction companies	The weighted sum of proven developed (weight=1), proven undeveloped (0.9), probable (0.5) and possible (0.1) reserves	No data available	Discovered reserves	SEEA with weights
United Kingdom	UK Department of Trade & Industry	The un-weighted sum of proven and probable reserves	Upper and lower range of the estimated undiscovered reserves	Discovered and (lower range of) undiscovered reserves	more than SNA but less than SEEA
Norway	Norwegian Petroleum Directorate (NPD)	Expected level of discovered reserves, estimate by NPD	Expected level of undiscovered, estimate by NPD	Discovered and (expected level of) undiscovered	SEEA

¤For calculation methodology: Van den Berg, A. and P. van de Ven, Statistics Netherlands (2001) Valuation of oil and gas reserves in the Netherlands. Eurostat Working paper No. 2/2001/B/3.

Source: Eurostat (2002), Natural Resource Accounts for Oil and Gas, 1980-2000 (pages 15 and 34)

At the 2003 London Group meeting, a Subgroup on Mineral and Energy Accounts was established, with the objectives of addressing the unresolved methodological issues and of preparing a compilation guide on mineral and energy asset accounts.

The first task undertaken by the Subgroup on Mineral and Energy Accounts was to make a survey of country practices among the countries that are part of the London Group, with the objective to identify the methods used to compile subsoil asset accounts. As expected, this survey also confirmed the results that Eurostat has also obtained regarding the diversity in country practices. It showed that there was considerable experience in the compilation of the accounts, but the applications of the SEEA-2003 recommendations are not applied consistently in the countries. This applies to methods used, definitions and classifications.

The two surveys of country practices revealed that one of the biggest variations among countries that compile oil and gas assets accounts, were the way oil and gas reserves were classified and which types of oil and gas reserves were included in the monetary asset accounts calculations. The explanation of this inconsistency in classification of physical oil and gas assets might be related to the lack of an international classification system for these assets. It may also be partially explained by the fact that the institutions actually classifying

the oil and gas reserves are most likely principally serving other needs than those related to the compiling of monetary asset accounts of oil and gas.

In spite of countries use of different classification systems, they all tend to group their reserves of oil and gas into different categories depending on the certainty of knowledge related to economical recoverability concerning the resources. Different categories are used in different parts of the world, but three terms in common use are "proven", "probable" and "possible" reserves. Which of these categories to define as discovered versus undiscovered reserves differs. Some include in the term "discovered reserves" only proven reserves, others proven and probable reserves and others again include a weighted sum of proven, probable and possible reserves (see for example Austria in the Eurostat information in Table 1).

3.4 On monetary asset accounts in SNA-1993 and SEEA-2003

The SNA-1993 only records assets with monetary values and formally includes only proven subsoil reserves on it list of assets. The SEEA-2003 includes proven, probably and possible reserves in its physical asset accounts. Some countries also include estimated hypothetical reserves. Although the asset boundaries in the SEEA-2003 have been expanded from the SNA-1993 definition, it is unclear whether all categories of the reserves should be included in the valuation calculations (SEEA-2003 manual §7.43, §8.21 - §8.42). This is shown by the way countries are calculating the value of their petroleum reserves (see table 1).

The main issue regarding the physical assets which needs further work is to agree on which assets to include in the valuation calculation and how these should be included. If the asset's physical definition changes then the calculations based on these assets will change.

3.5 Alternative treatments and solutions to the issue

The Country studies conducted by Eurostat and the Subgroup on Mineral and Energy Accounts exposed the lack harmonization of the classification of subsoil assets. Since the publication of the SEEA-2003 manual and the Eurostat detailed tables/guidelines, a new UN Framework Classification (UNFC) for subsoil assets has been developed, which provides a framework classification to which existing classifications can be harmonized and compared (see section 4 that follows).

Depending on the objectives or reasons for compiling asset accounts, one could discuss the need for harmonized methods for the compilation of subsoil assets accounts. The use of an internationally agreed upon definition and methodology for the compilation of subsoil asset accounts will assure better comparability of collected data on subsoil assets by the institutions conducting internationally studies, as well as assure the use of good quality methods for the compiling of assets accounts used only for national purposes.

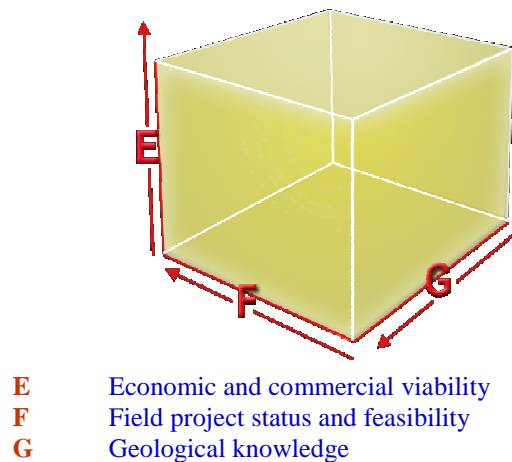## 4. Concerns/shortcomings of the treatment of the issue

Since the publication of the SEEA-2003 manual, there is a newly developed framework classification which has been developed in connection with the UNECE Ad Hoc Group of Experts on Harmonization of Fossil Energy and Mineral Resources Terminology.

Briefly this new classification system has three-dimensions or criteria:
E   Economic and commercial viability

**F**   Field project status and feasibility
G   Geological knowledge

Figure 2: Total Remaining Resources are Categorized by Three Criteria

E   Economic and commercial viability
F   Field project status and feasibility
G   Geological knowledge

Source: Blystad, The United Nations Framework Classification for Fossil Energy and Mineral Resources, UNFC
http://www.unece.org/ie/se/pdfs/UNFC/nov05/9nov/Blystad_NorPetDirect_9Nov1.pdf or
http://www.ssb.no/ocg/blystad_unfc_oslocitygroup2006.ppt

This 3-dimensional system is sub-defined further into specific categories which define areas that are named by their coordinates. The system is defined so that each cell has a unique coordinate name and location. When describing the different grades of the assets, the coordinate name can be used instead of the current approach which uses the often imprecise descriptive names such as "proven reserves" or "probable reserves".

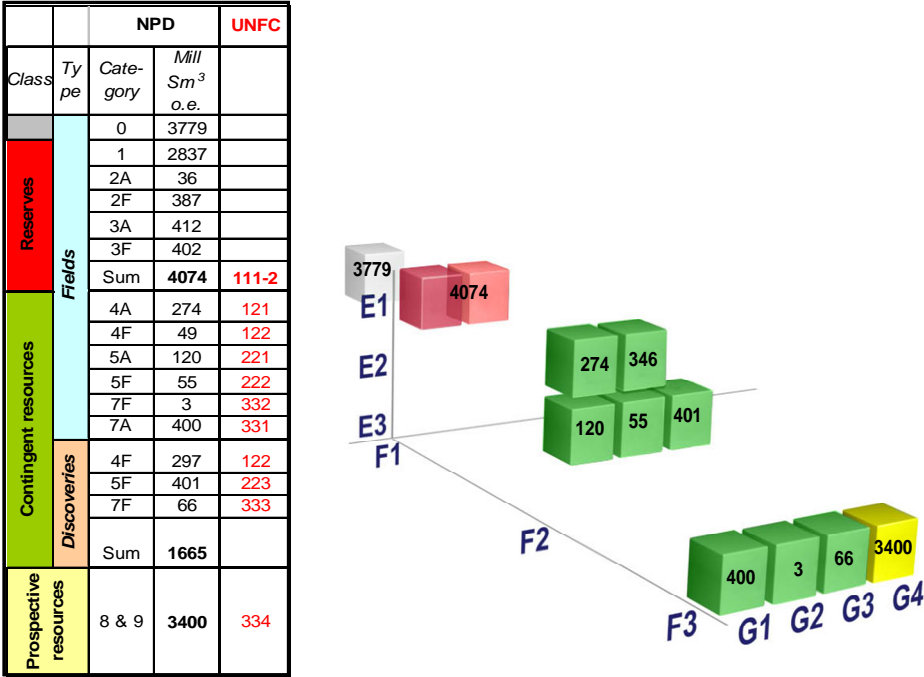## Figure 3: Categories of the United Nations Framework Classification (UNFC)
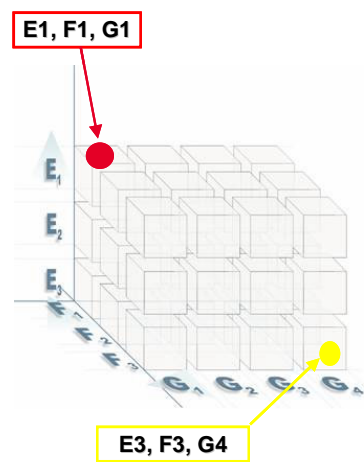
•The criteria (E, F, G) are divided into categories (1, 2, 3, and for G there is also a category 4).
•Resource volumes are classified by an E, an F and a G category

Source: Blystad, The United Nations Framework Classification for Fossil Energy and Mineral Resources, UNFC
http://www.unece.org/ie/se/pdfs/UNFC/nov05/9nov/Blystad_NorPetDirect_9Nov1.pdf or
http://www.ssb.no/ocg/blystad_unfc_oslocitygroup2006.ppt

The UNFC is now working towards the international adoption of this system for asset classification. This will take some time since it means that country specific systems need to be

converted to this new system. An example of this conversion can be found for Norway. The original classification system has 3 main categories, prospective resources (shown in yellow in the following figure), contingent resources (green, 4A-7F) and reserves (red, 1-3F). When this is converted into the new UNFC system the reserves are in cell 111 and 112 (red squares), the contingent resources are shown in green and the prospective resources are in cell 334 and are shown in yellow. The conversion is shown in the following figure.

Figure 4. Norway's Resource Account Presented in the UNFC Classification, account as of 31.12.2003. Million Sm^3 o.e.

Class	Type	Category	NPD Mill Sm^3 o.e.	UNFC
		0	3779	
Reserves	Fields	1	2837	
		2A	36	
		2F	387	
		3A	412	
		3F	402	
		Sum	**4074**	**111-2**
Contingent resources	Fields	4A	274	121
		4F	49	122
		5A	120	221
		5F	55	222
		7F	3	332
		7A	400	331
	Discoveries	4F	297	122
		5F	401	223
		7F	66	333
		Sum	**1665**	
Prospective resources		8 & 9	**3400**	334

This figure shows that the UNFC system has a greater amount of variation allowed than the current Norwegian system for the contingent resources category (green) and fewer for the reserves portion (red). Currently in Norway the UNFC system is being tested with the view towards adopting this system in the future.

Next step
Since the SEEA has been based on the McKelvey diagram and classification system terminology this needs to be potentially replaced or at least augmented with the UNFC system. However, there has been no direct conversion system devised between the McKelvey system and the UNFC system. This means that there is no easy conversion that can simply be applied to the existing SEEA-2003 guidelines.

The result is that a revision of the guidelines for subsoil assets should consider basing itself on the UNFC system and not on the McKelvey system. However it will be necessary to have help deciding which sections of the UNFC system should be included in the valuation calculations and how (for example weighting or not weighting some of the blocks).

The UNFC experts have already come with some guidelines with respect to the use of the new UNFC system:

- o UNFC recommends to use the terms *low, best* and *high* estimate instead of **proved, probable** and **possible.**
- o Geological knowledge; category G1 equals proved, G2 probable and G3 possible reserves.
- o **Committed reserves** are restricted to F1.1 and F1.2.
- o **Proved reserves** are subset of Committed Reserves.
- o Proved reserves can be categorized as developed or undeveloped.

These guidelines can be the start in terms of how the London Group would recommend the use of the various UNFC asset categories when calculating the value of these assets. We would suggest that the experts from the UNFC need to be consulted regarding which of the assets should be included before the London Group can make their final recommendations in the new manual for sub-soil assets.

5. Questions/points for discussion.

From the draft outline for the new sub-soil assets guidelines/manual, this topic is to be covered in chapter 2: Asset accounts in physical terms, section 2.2: Classifications. Given this, the question then becomes, since the UNFC now exists, should this be included in the new guidelines for subsoil assets? and if so how? Should the UNFC be used as the basis or simply referred to as yet another classification system without further recommendations?

If the UNFC system becomes the basis for physical assets, which of the classification system (blocks) should be included in the calculations for valuation?

Who should give advice on this? UNFC? Oslo City Group? Don't need any further advice, the subgroup can simply make a decision?

6. Annex of the most relevant documents.

United Nations

1. United Nations Framework Classification (UNFC) web site:
   http://www.unece.org/ie/se/reserves.html

2. United Nations Framework Classification for Fossil Energy and Mineral Resources
   http://www.unece.org/ie/se/pdfs/UNFC/UNFCemr.pdf

Eurostat Publications:

3. European Commission (2002): Natural Resource Accounts for Oil and Gas, 1980-2000. Office for Official Publications of the European Communities, Luxembourg.

4. European Commission (2000): Accounts for subsoil assets -- Results of pilot studies in European countries. Office for Official Publications of the European Communities, Luxembourg. ISBN: 92-894-0056-0

Oslo City Group (for energy statistics)

5. Oslo group web site: http://www.ssb.no/ocg/