

## **United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC-2009)**

### **SECTION I**

1. The United Nations Framework Classification (UNFC-2009) applies to fossil energy and mineral reserves and resources located on or below the Earth's surface. It serves the needs for classification at a global level (for energy and mineral supply studies), for governments (resources management and policy formulation), for industry (business process management) and for financial reporting.

### **SECTION II**

2. The UNFC is a generic system in which quantities are classified 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 as set out and defined in Annexes I and II.

3. The first set of categories (the E axis) designates the degree of favourability of social and economic conditions in establishing the commercial viability of the project, including consideration of market prices and relevant legal, regulatory, environmental and contractual conditions. The second set (the F axis) designates the maturity of studies and commitments necessary to implement mining plans or development projects. These extend from early exploration efforts before a deposit or accumulation has been confirmed to exist through to a project that is extracting and selling a commodity, and reflect standard value chain management principles. The third set of categories (the G axis) designates the level of confidence in the geological knowledge and potential recoverability of the quantities.

. The categories and sub-categories are the building blocks of the system, and are combined in the form of "classes". The UNFC can be visualised in three dimensions, as shown in Figure 1, or represented in a practical two-dimensional abbreviated version as shown in Figure 2.

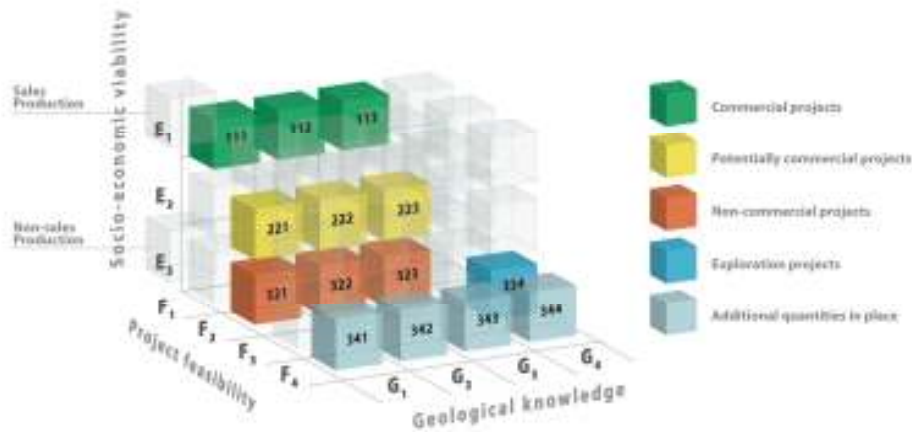
### **SECTION III**

5. A class is uniquely defined by selecting from each of the three criteria a particular combination of a category or a sub-category (or groups of categories/sub-categories). Since the codes are always quoted in the same sequence (i.e. E; F; G), the letters may be dropped and just the numbers retained. The numerical code defining a class is then identical in all languages using Arabic numerals.

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**Figure 1. UNFC categories and examples of classes**

**Comment [JGR1]:** Figure to be improved in clarity and axis labels added



6. While there are no explicit restrictions on the possible combinations of E, F and G categories or sub-categories, only a limited number will generally be applicable. For the more important combinations (classes and sub-classes), specific labels are provided as a support to the numerical code, as illustrated in Figure 2.

7. As shown in Figure 2, the total commodity initially in place is classified at a given date in terms of the following:

- Recovered quantities that have been sold – Sales Production.
- Recovered quantities that have not been sold – Non-sales Production.
- Quantities associated with a known deposit that may be recovered in the future by extractive activities. Technical and commercial evaluation studies based on defined development projects or mining operations constitute the basis for the classification.
- Additional quantities in place associated with a known deposit that will not be recovered by any currently defined development project or mining operation.
- Quantities associated with a potential deposit that may be recovered in the future provided that the deposit is confirmed.
- Additional quantities in place associated with a potential deposit that would not be expected to be recovered even if the deposit is confirmed.

8. Material balance of total quantities can be maintained by full application of the classification. For this purpose a reference point shall be established where the quantity, quality and sales (or transfer<sup>1</sup>) price of recovered quantities are determined.

<sup>1</sup> In large integrated projects, it may be necessary to determine an internal “transfer” price between “upstream” operations and “midstream” or “downstream” operations based on a netback calculation.

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Figure 2. Abbreviated version of the UNFC, showing primary classes

Total commodity initially in place	Extracted		Sales Production			
			Non-sales Production <sup>2</sup>			
	Class		Categories			
			E	F	G <sup>3</sup>	
	Future recovery by commercial development projects or mining operations		Commercial Projects <sup>4</sup>	1	1	1, 2, 3
	Potential future recovery by contingent development projects or mining operations		Potentially Commercial Projects <sup>5</sup>	2 <sup>6</sup>	2	1, 2, 3
			Non-Commercial Projects <sup>7</sup>	3	2	1, 2, 3
	Additional quantities in place associated with known deposits <sup>8</sup>			3	4	1, 2, 3
	Potential future recovery by successful exploration activities		Exploration Projects	3	3	4
	Additional quantities in place associated with potential deposits <sup>8</sup>			3	4	4

9. With the exception of past production that may be measured, quantities are always estimated. There will be a degree of uncertainty associated with the estimates. The uncertainty is communicated either by quoting discrete quantities of decreasing levels of confidence (high, moderate, low) or by generating three specific scenarios or outcomes (low, best and high estimates). The former approach is typically applied for solid minerals, while the latter method is commonly used in petroleum. A low estimate scenario is directly equivalent to a high confidence estimate (i.e. G1), whereas a best estimate scenario is equivalent to the combination of the high confidence and moderate confidence estimates (G1+G2). A high estimate scenario is equivalent to the combination of high, moderate and low confidence estimates (G1+G2+G3). Quantities may be estimated using deterministic or probabilistic methods.

10. Where relevant, discovered quantities that may be recovered in the future are subdivided into quantities that are forecast to be sold and quantities that are forecast to be extracted but not sold.

<sup>2</sup> Future non-sales production is categorized as E3.1. Resources that will be extracted but not sold can exist for all classes of recoverable quantities. They are not shown in the figure.

<sup>3</sup> G categories may be used discretely, particularly when classifying solid minerals and quantities in place, or in cumulative form (e.g. G1+G2), as is commonly applied for recoverable fluids.

<sup>4</sup> Commercial Projects have been confirmed to be technically, economically and socially feasible. Recoverable quantities associated with Commercial Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within the extractive industries and hence the term is not used here.

<sup>5</sup> Potentially Commercial Projects are expected to be developed in the foreseeable future, in that the quantities are assessed to have reasonable prospects for eventual economic extraction, but technical and/or commercial feasibility has not yet been confirmed. Consequently, not all Potentially Commercial Projects may be developed.

<sup>6</sup> Potentially Commercial Projects may satisfy the requirements for E1.

<sup>7</sup> Non-Commercial Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become commercially feasible developments within the foreseeable future.

<sup>8</sup> A portion of these quantities may become recoverable in the future as technological developments occur. Depending on the commodity type and recovery technology (if any) that has already been applied, some or all of these quantities may never be recovered due to physical and/or chemical constraints.

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11. Potentially recoverable quantities may be recovered in the future through projects that are contingent on one or more conditions yet to be fulfilled. Contingent projects are classified into projects for which the social and economic conditions are expected to be acceptable for implementation and those where they are not. In the former case, contingency is caused by the recovery project not being sufficiently matured to confirm technical and/or commercial feasibility, which can then provide the basis for a commitment to extract and sell the commodity at a commercial scale. In the latter case, neither the project nor the economic and social conditions are sufficiently matured to indicate a reasonable potential for commercial recovery and sale in the foreseeable future. A deposit or an accumulation may give rise to several projects with different status.

### SECTION IV

12. For further clarity in global communications, additional generic UNFC sub-classes are defined based on the full granularity provided by the sub-categories included in Annex II. These are illustrated in Figure 3.

**Figure 3. UNFC classes and sub-classes defined by sub-categories<sup>9</sup>**

UNFC Classes defined by categories and sub-categories						
Total commodity initially in place	Extracted	Sales Production				
		Non-sales Production				
	Known Deposit	Class	Sub-class	Categories		
				E	F	G
		Commercial Projects	On Production	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 Projects	Development Pending	2 <sup>10</sup>	2.1	1, 2, 3
			Development On Hold	2	2.2	1, 2, 3
		Non-Commercial Projects	Development Unclassified	3.2	2.2	1, 2, 3
			Development Not Viable	3.3	2.3	1, 2, 3
Additional quantities in place		3.3	4	1, 2, 3		
Potential Deposit	Exploration Projects	[No sub-classes defined] <sup>11</sup>	3.2	3	4	
	Additional quantities in place		3.3	4	4	

<sup>9</sup> Refer also to the footnotes for Figure 2.

<sup>10</sup> Development Pending Projects may satisfy the requirements for E1.

<sup>11</sup> Generic sub-classes have not been defined here, but it is noted that in petroleum the terms Prospect, Lead and Play are commonly adopted.

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### **SECTION V**

13. Classifications other than the one shown in Figure 2 can be generated by choosing appropriate combinations of categories, or by grouping or further subdividing the categories. This permits the harmonization of resource inventories that are developed on the basis of different classification systems.

14. Conversely, when the unabbreviated UNFC is used to build a resource inventory, this can be converted to inventories developed on other harmonized classifications without going back to the basic resource information.

### **SECTION VI**

15. Classifications often need to be adapted to national or local needs. Modifications of this nature should be checked for consistency with the unabbreviated UNFC and other applications in use.

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## Annex I. Definition of Categories and Supporting Explanations<sup>12,13</sup>

Category	Definition	Supporting Explanation
E1	Extraction and sale has been confirmed to be economically viable. <sup>14</sup>	Extraction and sale 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 timeframe. 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. <sup>14</sup>	Extraction and sale 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 extraction and sale in the foreseeable future.
E3	Extraction and sale is not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability. <sup>14</sup>	On the basis of realistic assumptions of future market conditions, it is currently considered that there are not reasonable prospects for economic extraction and sale in the foreseeable future; or, economic viability of extraction cannot yet be determined due to insufficient information (e.g. during the exploration phase). Also included are quantities that are forecast to be extracted, but which will not be available for sale.
F1	Feasibility of extraction by a defined development project or mining operation has been confirmed.	Extraction is currently taking place; or, implementation of the development project or mining operation is underway; or, sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined development project or mining operation.
F2	Feasibility of extraction by a defined development project or mining operation is subject to further evaluation.	Preliminary studies demonstrate the existence of a deposit in such form, quality and quantity that the feasibility of extraction by a defined (at least in broad terms) development project or mining operation can be evaluated. Further data acquisition and/or studies may be required to confirm the feasibility of extraction.
F3	Feasibility of extraction by a defined development project or mining operation cannot be evaluated due to limited technical data.	Very preliminary studies (e.g. during the exploration phase), which may be based on a defined (at least in conceptual terms) development project or mining operation, indicate the need for further data acquisition in order to confirm the existence of a deposit in such form, quality and quantity that the feasibility of extraction can be evaluated.
F4	No development project or mining operation has been identified.	In situ (in-place) quantities that will not be extracted by any currently defined development project or mining operation.
G1	Quantities associated with a known deposit that can be estimated with a high level of confidence.	For in situ (in-place) quantities, and for recoverable estimates of fossil energy and mineral resources that are extracted as solids, quantities are typically categorised discretely, where each discrete estimate reflects the level of geological knowledge and confidence associated with a specific part of the deposit. The estimates are categorised as G1, G2 and/or G3 as appropriate.  For recoverable estimates of fossil energy and mineral resources that are extracted as fluids, their mobile nature generally precludes assigning recoverable quantities to discrete parts of an accumulation. Recoverable quantities should be evaluated on the basis of the impact of the development scheme on the accumulation as a whole and are usually categorised on the basis of three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G2	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	
G3	Quantities associated with a known deposit that can be estimated with a low level of confidence.	
G4	Estimated quantities associated with a potential deposit, based primarily on indirect evidence.	Quantities that are estimated during the exploration phase are subject to a substantial range of uncertainty as well as a major risk that no development project or mining operation may subsequently be implemented to extract the estimated quantities. Where a single estimate is provided, it should be the expected outcome but, where possible, a full range of uncertainty in the size of the potential deposit should be documented (e.g. in the form of a probability distribution). In addition, it is recommended that the chance (probability) that the potential deposit will become a deposit of any commercial significance is also documented.

<sup>12</sup> The term “extraction” is equivalent to “production” when applied to petroleum.

<sup>13</sup> The term “deposit” is equivalent to “accumulation” or “pool” when applied to petroleum.

<sup>14</sup> The phrase “economically viable” encompasses economic (in the narrow sense) plus other relevant “market conditions”, and includes consideration of prices, costs, legal/fiscal framework, environmental, social and all other non-technical factors that could directly impact the viability of a development project.

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### Annex II. Definition of Sub-Categories

Category	Sub-Category	Sub-Category Definition
E1	E1.1	Extraction and sale is economic on the basis of current market conditions and realistic assumptions of future market conditions.
	E1.2	Extraction and sale is not economic on the basis of current market conditions and realistic assumptions of future market conditions, but is made viable through government subsidies and/or other considerations.
E2	No sub-categories defined.	
E3	E3.1	Quantities that are forecast to be extracted, but which will not be available for sale.
	E3.2	Economic viability of extraction cannot yet be determined due to insufficient information (e.g. during the exploration phase).
	E3.3	On the basis of realistic assumptions of future market conditions, it is currently considered that there are not reasonable prospects for economic extraction and sale in the foreseeable future.
F1	F1.1	Extraction is currently taking place.
	F1.2	Capital funds have been committed and implementation of the development project or mining operation is underway.
	F1.3	Sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined development project or mining operation.
F2	F2.1	Project activities are ongoing to justify development in the foreseeable future.
	F2.2	Project activities are on hold and/or where justification as a commercial development may be subject to significant delay.
	F2.3	There are no current plans to develop or to acquire additional data at the time due to limited potential.

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# **Appendix**

## **United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC-2009) Explanatory Note**

### **Introduction**

1. By 2004, the United Nations Economic Commission for Europe (UNECE)<sup>15</sup> had developed the United Nations Framework Classification for Fossil Energy and Mineral Resources (UNFC) and submitted it to the United Nations Economic and Social Council recommending worldwide application.

2. At its 42nd Plenary Meeting, on 16 July 2004, the Economic and Social Council<sup>16</sup>, recalling its decision 1997/226 of 18 July 1997, welcomed the endorsement by UNECE of the United Nations Framework Classification for Fossil Energy and Mineral Resources and decided to invite the Member States of the United Nations, international organizations and the regional commissions to consider taking appropriate measures for ensuring worldwide application of the Framework Classification. The Council noted that the new classification for fossil energy and mineral resources, which now included energy commodities (for example, natural gas, oil and uranium), was an extension of the earlier framework developed for solid fuels and mineral commodities, on which the Council had taken similar action in 1997 upon endorsement and recommendation by UNECE.

3. The UNECE Committee on Sustainable Energy has been assisted by the Ad Hoc Group of Experts on the Harmonization of Fossil Energy and Mineral Resources Terminology (Group of Experts) in dealing with this matter.

4. At its sixteenth session in November 2007, the Committee on Sustainable Energy directed the Group of Experts to submit any revised UNFC for consideration by the Extended Bureau of the Committee on Sustainable Energy in 2008 in order to facilitate worldwide application of the UNFC. A simplified revised version of the classification (UNFC-2009) was prepared in response to that request. This Explanatory Note explains in some detail the issues contained in the revised classification. It is intended as initial guidance for interpretation of the UNFC-2009, but does not form part of the classification itself.

5. The Task Force that prepared the UNFC-2009 proposal consisted of the Extended Bureau of the Group of Experts, namely Thomas Ahlbrandt (American Association of Petroleum Geologists (AAPG)), Andrej Subelj (Slovenia), David Elliott (Alberta Securities Commission, Canada), Sigurd Heiberg (StatoilHydro), Delores Hinkle (Society of Petroleum Engineers (SPE) Oil and Gas Reserves Committee (OGRC)), Fatih Birol (International Energy Agency (IEA)), Ferdinando Camisani-Calzolari (Combined Reserves International Reporting Standards Committee (CRIRSCO)), Mohamed Hamel (Organization of the Petroleum Exporting Countries), Mucella Ersöy (Turkish Coal Enterprises), Per Blystad (Norwegian Petroleum Directorate) and Yuri Podturkin (State Commission of Mineral Reserves, Russian Federation), supplemented by Glenn Brady (Australian Accounting Standards Board), István Bérczi (European Federation of Geologists (EFG) and AAPG), James Ross (Ross Petroleum Limited) and Niall Weatherstone (CRIRSCO). It was led by Mr. Heiberg, the Chairperson of the Group of Experts, and managed by Charlotte Griffiths of the UNECE Sustainable Energy Division.

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<sup>15</sup> UNECE is one of the five regional commissions of the United Nations. It represents Europe, Central Asia, North America and Israel.

<sup>16</sup> Resolution 2004/233 of the United Nations Economic and Social Council pertaining to the United Nations Framework Classification for Fossil Energy and Mineral Resources.



## II. Relationship to other classifications

6. Throughout the twentieth century, many different systems were developed for resource classification, reflecting the different physical characteristics of the resources as well the geographic and socio-economic diversity of the producing areas. Although there was always a certain desire and will, there was no particular requirement to harmonize terminology or to agree to common classification systems. More recently, as the globalization of commodity trading and financial markets has become firmly established, a consensus developed that a harmonized framework classification system would be extremely beneficial. Development work on the UNFC began in 1992 and led to a three dimensional classification system to which most other solid minerals systems were able to relate.

7. By 2004, the UNFC had been further developed in order to address all fossil energy and mineral resources. Since then, other important classifications have been developed or significantly updated. These include the New Russian Classification of 2005, the CRIRSCO Template of 2006 and the Petroleum Resource Management System of SPE/WPC/AAPG/SPEE (SPE-PRMS) of 2007. In 2007 and 2008, the Group of Experts, in cooperation with experts representing these professional bodies, undertook an extensive mapping exercise, under the UNFC Mapping Task Force. The work showed that the CRIRSCO Template and SPE-PRMS could be aligned with the UNFC. The Report of the Mapping Task Force recommended making some modifications to the UNFC to facilitate this.

8. UNFC-2009 reflects the recommendations of the Mapping Task Force by providing a high-level umbrella classification under which more detailed commodity-specific guidelines, as reflected in the CRIRSCO Template and SPE-PRMS, can coexist. The definitions of the UNFC categories and sub-categories have been simplified and the most commonly-used classes are defined using plain language, providing harmonized generic terminology at a level suitable for global communications.

## II. Maintenance of the classification

9. The resulting classification(s) will need to meet requirements of relevance, materiality, reliability and comparability with respect to the principal needs they aim to serve. This may require complementary texts to be developed in dialogue with all the stakeholders.

## III. Normative references

10. The following normative reference document contains provisions which, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to or revisions of the publication do not apply. However, Parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. The members of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) maintain registers of currently valid International Standards. *ISO1000:1992, SI Units (Système International d'Unités) and recommendation for the use of their multiples and certain other units.*

## IV. Acknowledgements

11. The UNFC has been developed through the cooperation and collaboration of UNECE and non-UNECE member countries, other United Nations agencies and international organizations, intergovernmental bodies, and professional associations, including AAPG, CRIRSCO, EFG, International Accounting Standards Board (IASB), International Atomic Energy Agency (IAEA), IEA, International Energy Forum Secretariat (IEFS), International Valuation Standards Committee (IVSC), Organisation for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA),

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OPEC, SPE, Society of Petroleum Evaluation Engineers (SPEE), World Energy Council (WEC), World Petroleum Council (WPC) and the private sector.

12. This document builds on the work of a Task Force that mapped key classifications to one another, the UNFC Mapping Task Force. The Task Force was led by Ms. Mucella Ersöy (Turkish Coal Enterprises) and Mr. Per Blystad (Norwegian Petroleum Directorate) with Mr. Niall Weatherstone (CRIRSCO), Mr. Ferdi Camisani-Calzolari (CRIRSCO), Mr. John Etherington (SPE OGRC), Mr. Kirill Kavun (Research Institute for Economics of Mineral Resources and Use of the Subsoil (VIEMS) Russian Federation), Mr. James Ross (Ross Petroleum Limited), and Mr. Andrej Subelj (Slovenia).

13. The diligent efforts made in preparing the ground for the revision of the UNFC have been commendable and are greatly appreciated.

### **V. Comments to the UNFC-2009**

14. The following comments refer to specific sections of the Classification. This document is appended to the Classification for ease of reference.

#### **To Section I (UNFC-2009)**

15. This section states that the UNFC is an inclusive classification with respect to fossil energy and mineral resources. However, it does not make reference to energy resources contained in physical fields (of pressure and temperature). It also does not make reference to groundwater resources, although it is applicable to projects that are extracting non-renewable groundwater.

16. Application of the UNFC to recipient reservoirs for permanent storage or for temporary inventory is not addressed in the classification.

17. The classification aims to serve the four principal needs mentioned in Section I.

#### **To Section II (UNFC-2009)**

18. The text establishes how conditions in the economic and social domain, the industrial domain (project/mine feasibility) and the geological domain are reflected in the categories used to define classes of in-place and recoverable quantities.

#### **To Section III (UNFC-2009)**

19. Classes of in-place and recoverable quantities are here defined in terms of the categories of Section II.

20. The recoverable quantities are those that are estimated to eventually be produced. An important aspect of the classification is the definition of a reference point for produced quantities where production is measured directly or estimated from indirect measurements, whether it is sales production or non-sales production. This allows quantities, qualities and values to be defined.

21. Simple language is used throughout, avoiding the use of key words that do not have a unique meaning. Most importantly, the word “reserves” is not used other than in a general sense.

22. In existing classifications, the term “reserves” is for the most part used to describe the quantities that commercial recovery projects are forecast to produce. Classifications relating to the recovery of solid minerals often add the additional restriction that the quantity is known with a high level of

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confidence where used in the context of “proved” or “proven” [mineral] reserves. Recovery projects producing or using fluids will typically have a much broader range of uncertainty with respect to recoverable quantities that result from a given recovery effort. Here, the term “proved” or “proven” reserves is applied to the outcome that has a high probability of being exceeded. The UNFC is fully compatible with both these practices.

23. However, “reserves” is a concept with different meanings and usage. Even within the extractive industries, where the term is carefully defined and applied, there are some material differences between the specific definitions that are used in different sectors. In the public domain, many will use it to describe quantities that are recoverable from discovered deposits or accumulations, regardless of whether they are recoverable by commercial projects or by projects that are not (yet) commercial, or where they are thought to be technically recoverable without any consideration of possible recovery projects that would be required to actually recover the quantities. Others use expressions like “recoverable reserves” implying that for them, some reserves are not recoverable, and also phrases such as “undiscovered reserves” and even “in-place reserves”. While all of these usages are clearly incorrect when considered in the light of certain widely-used definitions, such as those of CRIRSCO and SPE, the fact that the term has materially different meanings within the extractive industries indicates that it is not ideal as a basis for global communication of such an important quantity. This is the situation also in languages other than English.

24. This view is further supported by the observation that other common uses of the word “reserves” in English actually have a diametrically opposed meaning to the one most frequently used in the extractive activities. It is not used to describe quantities that are ready to be produced, but rather quantities of soldiers, wines etc. that are being kept “in reserve” – that is, not to be produced until later, or perhaps not at all.

25. “Commercial” is a key concept in the classification. It is used in its original sense to reflect what is prepared for buying and selling at scale.

26. Uncertainty is communicated in three complementary ways:

(i) The oldest, emanating from best practices in geologic analysis, is to communicate what has been “observed” or “measured”, what has been estimated with, or is indicated by, reasonably good geological control, and what has been extrapolated or inferred from observations, but with less or lacking geological control. This method of discrete estimates is well-suited to the characterisation of quantities in place in a deposit/accumulation and is also appropriate where estimated potentially recoverable quantities are based directly on those discrete in place estimates, as in the case of solid minerals.

(ii) The later industrial and commercial approach is to communicate the quantities that may be recovered by a given project. This may be dependent on a number of factors in addition to the quantities in place in the deposit/accumulation. The tradition in this scenario-based method is to communicate a probability that a project will produce at least the estimated quantity.

(iii) Except in the case of commercial projects, there may be a chance that development and production projects will not be realised. This is clearly the case in the exploration phase, where best practice is to communicate a probability that a discovery will be made of sufficient size to have the potential to lead to a commercial project, and then the probability distribution of the forecast recoverable quantities from that commercial project. The probability that potentially commercial projects associated with known deposits will actually be undertaken in the foreseeable future can likewise be communicated if the information is available. Alternatively, the information may be communicated by assigning the quantities to subclasses. For any single exploration prospect or development project, it may be constructive to communicate both the chance that it will lead to a commercial project and the range of quantities that may be produced from the project. When working with portfolios these quantities are generally discounted for the probability that they will materialise.

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27. The UNFC is consistent with these three best practices of communicating uncertainty.

### **To Sections IV and V (UNFC-2009)**

28. While the UNFC is a classification in its own right, its generic category definitions make it very suitable for comparing other classifications, and thus it can be used to facilitate their harmonization through highlighting changes that could be implemented to remove material differences between them. Both the application of the UNFC as a classification and the use of it for comparing to other classifications are facilitated by the subdivision or aggregation of categories to define classes which reflect the primary quantities that are generally and most usefully reported.

### **To Section VI (UNFC-2009)**

29. The same procedure of either subdividing or aggregating categories may be applied at the national or local level to meet specific needs arising for instance from national legislation, corporate decision procedures or needs not foreseen when issuing the classification initially. In order to ensure that problems of this nature are solved in a consistent way by different users of the classification, it is important to check the different adaptations for consistency with the basic UNFC and other national or local adaptations.

## **VI. Bibliography**

30. This bibliography refers to selected publications that have been important in the evolution of classifications up to today.

- (a) Society Of Petroleum Engineers, World Petroleum Congress And American Association Of Petroleum Geologists (2000) Petroleum Resources Classification and Definitions, approved by SPE, WPC and AAPG, February 2000, published by SPE.
- (b) IAEA-NEA/OECD, (2002), Uranium: Resources, Production and Demand, The IAEA Red Book.
- (c) UNECE, (2000), Report on Joint Meeting of the UNECE Task Force and CMMI International Mineral Reserves Committee (November 1999), ENERGY/2000/11, UNECE Committee on Sustainable Energy, Tenth Session, November 2000.
- (d) UNECE, (1997), United Nations International Framework Classification for Reserves/Resources - Solid Fuels and Mineral Commodities, ENERGY/WP.1/R.70, UNECE, Committee on Sustainable Energy, Seventh Session, November 1997, 21 p.
- (e) KELTER, D., (1991), Classification Systems for Coal Resources- A Review of the Existing Systems and Suggestions for Improvements, Geol.Jb. A 127; 347-359.
- (f) UNECE, (2002), ECE/ENERGY/47, UNECE Committee on Sustainable Energy, Report of its Eleventh Session, November 2001.
- (g) UNECE, (2004), ECE/ENERGY/53 and Corr. 1 including Annex II Programme of Work, UNECE Committee on Sustainable Energy, Report of its Thirteenth Session, November 2003.
- (h) UNECE, (2004), E/2004/37- E/ECE/1416, United Nations Economic Commission for Europe, Report of its Fifty-ninth Session, February 2004.

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- (i) Petroleum Classification of the Soviet Union (1928).
- (j) V.E. McKelvey, (1972), Mineral Resource Estimates and Public Policy: American Scientist, V.60, No.1, p.32-40.
- (k) United States Bureau of Mines and United States Geological Survey, (1980), Principles of a Resource/Reserve Classification for Minerals, United States Geological Survey, Circular 831, 5 p.
- (l) United Nations Framework Classification for Fossil Energy and Mineral Resources (2004) <http://www.unece.org/energy/se/reserves.html>.
- (m) Classification of Reserves and Prognostic Resources of Oil and Combustible Gases. Russian Federation Ministry of Natural Resources, Instruction N 298, November 1, 2005.
- (n) International Reporting Template for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves. Combined Reserves International Reporting Standards Committee, July 2006 <http://www.criresco.com/template.asp>.
- (o) Petroleum Resource Management System. Society of Petroleum Engineers, World Petroleum Council, American Associations of Petroleum Geologists, Society of Petroleum Evaluation Engineers 2007 <http://www.spe.org/spe-app/spe/industry/reserves/prms.htm>.
- (p) Report of the Task Force on Mapping of the United Nations Framework Classification for Fossil Energy and Mineral Resources. UNECE Ad Hoc Group of Experts on the Harmonization of Fossil Energy and Mineral Resources Terminology 2008. <http://www.unece.org/energy/se/reserves.html>.

## Abbreviations

AAPG	American Association of Petroleum Geologists
AASB	Australian Accounting Standards Board
CMMI	Council of Mining and Metallurgical Institutions
CRIRSCO	Combined Reserves International Reporting Standards Committee
EFG	European Federation of Geologists
Group of Experts	UNECE Ad Hoc Group of Experts on the Harmonization of Fossil Energy and Mineral Resources Terminology
IAEA	International Atomic Energy Agency
IASB	International Accounting Standards Board
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
IVSC	International Valuation Standards Committee
MOL	Hungarian Oil and Gas Plc.
NEA	Nuclear Energy Agency of OECD
NPD	Norwegian Petroleum Directorate
OPEC	Organization of the Petroleum Exporting Countries
SPE	Society of Petroleum Engineers
SPPE	Society of Petroleum Evaluation Engineers
UNECE	United Nations Economic Commission for Europe
UNFC	United Nations Framework Classification for Fossil Energy and Mineral Resources
VIEMS	Institute for Economics of Mineral Resources and the use of the Subsoil, Russian Federation
WEC	World Energy Council
WPC	World Petroleum Council