

ECONOMIC COMMISSION FOR EUROPE

**United Nations Framework Classification
for Fossil Energy and Mineral Reserves
and Resources 2009**

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FOREWORD

Establishing a complete picture of the current and future supply base of fossil energy and minerals is necessary for effective resources management. Accurate and consistent estimates of fossil energy and mineral reserves and resources, coherent with other scientific and social/economic information, are the foundation for such assessments. A number of different standards have evolved over time in response to local requirements, but we are now called to serve the needs that arise in a globalized economy. As a result, there has been growing interest in re-expressing earlier work in the form of common and universally applicable standards.

During the 1990s, ECE took the initiative to develop a simple, user-friendly and uniform system for classifying and reporting reserves and resources of solid fuels and mineral commodities in response to the wishes of member countries to develop a standard reporting system. The result of these efforts was the creation of the United Nations Framework Classification for Reserves and Resources of Solid Fuels and Mineral Commodities (UNFC-1997) which was endorsed by the United Nations Economic and Social Council (ECOSOC) in 1997. In 2004, the Classification was extended to also apply to petroleum (oil and natural gas) and uranium and renamed the UNFC for Fossil Energy and Mineral Resources 2004 (UNFC-2004), following which ECOSOC in its Resolution 2004/233 invited the Member States of the United Nations, international organizations and the United Nations regional commissions to consider taking appropriate measures for ensuring its worldwide application. This Resolution offered an opportunity to harmonize existing reserves and resources classifications, in response to the integration of financial and extractive activities worldwide.

In order to facilitate worldwide application of the Classification, the ECE Committee on Sustainable Energy directed the Ad Hoc Group of Experts on Harmonization of Fossil Energy and Mineral Resources Terminology (now the Expert Group on Resource Classification) to prepare and submit a revised United Nations Framework Classification for Fossil Energy and Mineral Resources (UNFC) for consideration by the Extended Bureau of the Committee. In response to that request a stronger, but also a simpler version of the Classification – **United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009)** – was prepared.

I am encouraged to note that UNFC-2009 was developed by ECE, under the global mandate given by ECOSOC, and through the cooperation and collaboration of both ECE and non-ECE member countries, other United Nations agencies and international organizations, intergovernmental bodies, professional associations, the private sector and many individual experts. The rigorous revision process, which included a public consultation, has resulted in a generic, intuitive and user-friendly Framework Classification as outlined in this publication.

Sustainable energy development is dependent on careful management of the world's non-renewable energy resources i.e. oil, natural gas, coal and uranium. UNFC-2009 has an important role to play in this process. The availability of these non-renewable energy resources over the longer term is of crucial importance to both energy consumers and producers, particularly as a large and growing population is coming out of poverty. UNFC-2009 will significantly facilitate

the availability of relevant and reliable information on energy reserves and resources in support of international and national resources management, of industry's management of exploration and production processes, of management of the associated international financial resources and for public awareness. It fills essential needs in our endeavours to build sustainable civilizations.

It is my pleasure to bring UNFC-2009 to your attention and to pay tribute to all those who have contributed to its development.

Ján Kubiš
Executive Secretary
United Nations Economic Commission for Europe

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PREFACE

The **United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009)** is a universally acceptable and internationally applicable scheme for the classification and reporting of fossil energy and mineral reserves and resources and is currently the only classification in the world to do so. As with extractive activities, UNFC-2009 reflects conditions in the economic and social domain, including markets and government framework conditions, technological and industrial maturity and the ever present uncertainties. It provides a single framework on which to build international energy and mineral studies, analyze government resource management policies, plan industrial processes and allocate capital efficiently.

UNFC-2009 is a generic principle-based 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 and language independent coding scheme. Combinations of these criteria create a three-dimensional system. UNFC-2009, which can either be applied directly or used as a harmonizing tool, is the successor to the UNFC of 2004. The revision process has resulted in a simplified and user-friendly version of the Classification with generic high-level definitions. These are designed to ensure alignment with other widely used systems in the extractive industries – such as the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template and 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) – and to facilitate mapping with other classification systems. The definitions of the UNFC-2009 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. The use of commonly-used words that are widely misunderstood by non-experts and which do not have a unique meaning is avoided; most importantly, the word “reserves” is not used other than in a general sense - “reserves” is a concept with different meanings and usage, even within the extractive industries, where the term is carefully defined and applied by technical experts.

Today’s globalized world has resulted in an increasing number of multi-resource companies operating in many different countries and jurisdictions. In addition, the development of new types of resources, such as the mining of bitumen to produce synthetic crude oil, demonstrates that the historic boundaries between the minerals and petroleum sectors, which are reflected in different resource classification systems, public reporting requirements and accounting rules, is no longer sustainable. By covering all extractive activities, UNFC-2009 captures the common principles and provides a tool for consistent reporting for these activities, regardless of the commodity. UNFC-2009 is a strong code, offering simplicity without sacrificing completeness or flexibility. It paves the way for improved global communications which will aid stability and security of supplies, governed by fewer and more widely understood rules and guidelines. The efficiencies to be gained through the use of UNFC-2009 are substantial.

ACKNOWLEDGEMENTS

UNFC-2009 has been developed through the cooperation and collaboration of ECE and non-ECE member countries, other United Nations agencies and international organizations, intergovernmental bodies, professional associations and the private sector.

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 Mucella Ersoy (Turkish Coal Enterprises) and Per Blystad (Norwegian Petroleum Directorate) with Niall Weatherstone (CRIRSCO), Ferdinando Camisani-Calzolari (CRIRSCO), John Etherington (SPE Oil and Gas Reserves Committee), Kirill Kavun (Research Institute for Economics of Mineral Resources and Use of the Subsoil (VIEMS) Russian Federation), James Ross (Ross Petroleum Limited), and Andrej Subelj (Slovenia).

The diligent efforts made in preparing the ground for the revision of the UNFC have been commendable and are greatly appreciated, in particular the work of the UNFC Revision Task Force, which consisted of the Extended Bureau of the Ad Hoc Group of Experts, plus selected experts.

ACRONYMS AND ABBREVIATIONS

AAPG	American Association of Petroleum Geologists
Ad Hoc Group of Experts	ECE Ad Hoc Group of Experts on the Harmonization of Fossil Energy and Mineral Resources Terminology
CMMI	Council of Mining and Metallurgical Institutions
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
ECE	United Nations Economic Commission for Europe
IAEA	International Atomic Energy Agency
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NEA	Nuclear Energy Agency of OECD
OECD	Organisation for Economic Co-operation and Development
SPE	Society of Petroleum Engineers
SPEE	Society of Petroleum Evaluation Engineers
UNFC	United Nations Framework Classification for Fossil Energy and Mineral Resources
UNFC-2009	United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009
VIEMS	Institute for Economics of Mineral Resources and the use of the Subsoil, Russian Federation
WPC	World Petroleum Council

INTRODUCTION

At its sixteenth session in November 2007, the Committee on Sustainable Energy of the Economic Commission for Europe directed the Ad Hoc Group of Experts on Harmonization of Fossil Energy and Mineral Resources Terminology (now the Expert Group on Resource Classification) to submit any revised United Nations Framework Classification for Fossil Energy and Mineral Resources (UNFC) for consideration by the Extended Bureau of the Committee on Sustainable Energy in 2008 in order to facilitate worldwide application of the UNFC. In response to that request a simplified revised version of the Classification (United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009)) was prepared by the UNFC Revision Task Force, which consisted of the Extended Bureau of the Ad Hoc Group of Experts, plus selected experts. The Explanatory Note annexed to UNFC-2009 (Annex III) explains in some detail the issues contained in the revised Classification, but does not form part of the Classification itself.

The programme of work for 2009/10 of the Ad Hoc Group of Experts (ECE/ENERGY/GE.3/2009/2), as agreed at its sixth session, notes that the text of the revised draft UNFC-2009 should be prepared for its seventh session.

I. APPLICATION

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.

II. CATEGORIES AND SUB-CATEGORIES

UNFC-2009 is a generic principle-based 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.

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”. UNFC-2009 can be visualized in three dimensions, as shown in Figure 1, or represented in a practical two-dimensional abbreviated version as shown in Figure 2.

III. CLASSES

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.

Figure 1

UNFC-2009 categories and examples of classes

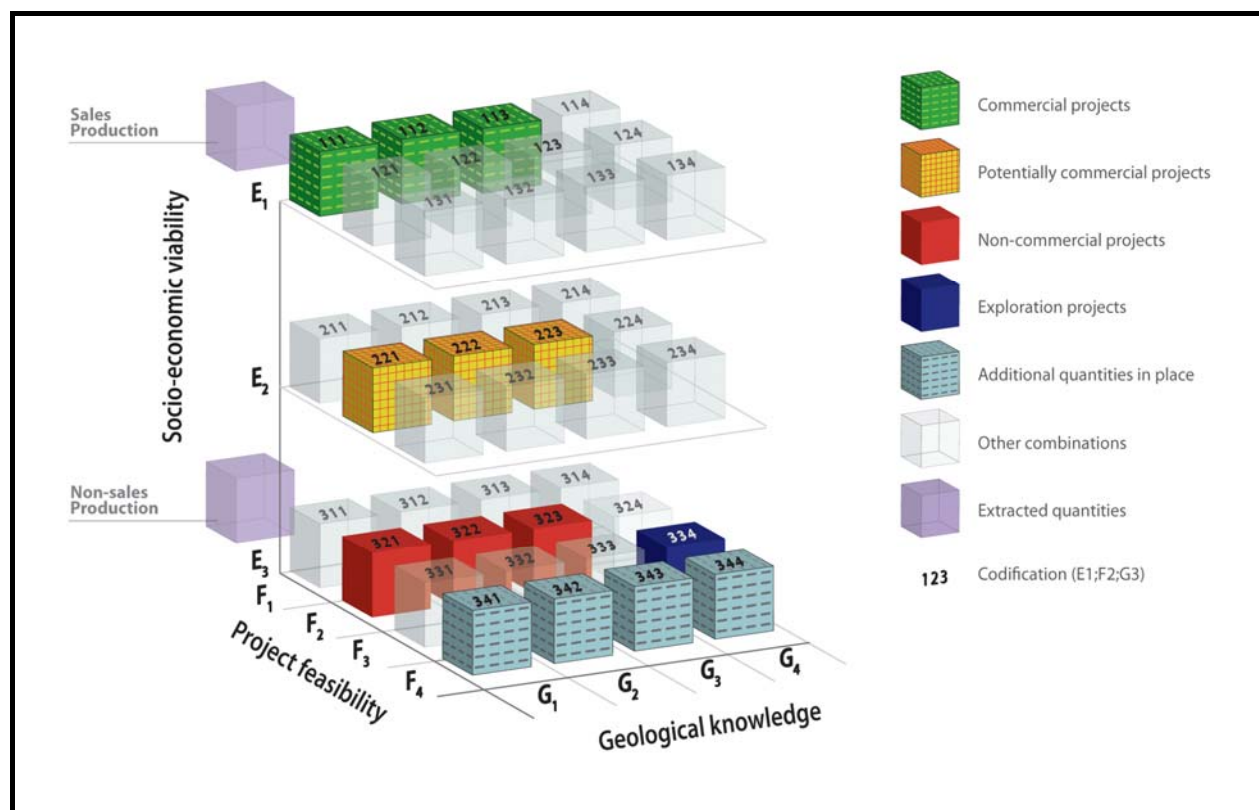


Figure 2

Abbreviated version of UNFC-2009, showing primary classes

Total Commodity Initially in Place	Extracted	Sales Production			
		Non-Sales Production ^a			
		Class	Categories		
			E	F	G ^b
	Future recovery by commercial development projects or mining operations	Commercial Projects ^c	1	1	1, 2, 3
	Potential future recovery by contingent development projects or mining operations	Potentially Commercial Projects ^d	2 ^e	2	1, 2, 3
		Non-Commercial Projects ^f	3	2	1, 2, 3
	Additional quantities in place associated with known deposits ^g		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 ^g		3	4	4

^a 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.

^b 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.

^c 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.

^d 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.

^e Potentially Commercial Projects may satisfy the requirements for E1.

^f 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.

^g 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.

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.

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

- (a) Extracted quantities that have been sold – Sales Production.
- (b) Extracted quantities that have not been sold – Non-sales Production.
- (c) 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.
- (d) Additional quantities in place associated with a known deposit that will not be recovered by any currently defined development project or mining operation.
- (e) Quantities associated with a potential deposit that may be recovered in the future provided that the deposit is confirmed.
- (f) Additional quantities in place associated with a potential deposit that would not be expected to be recovered even if the deposit is confirmed.

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 transfer¹) price of recovered quantities are determined.

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.

¹ 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.

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.

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.

IV. SUB-CLASSES

For further clarity in global communications, additional generic UNFC-2009 sub-classes are defined based on the full granularity provided by the sub-categories included in Annex II. These are illustrated in Figure 3.

V. HARMONIZATION OF RESOURCE INVENTORIES

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.

Conversely, when the unabbreviated UNFC-2009 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.

VI. ADAPTING TO NATIONAL OR LOCAL NEEDS

Classifications often need to be adapted to national or local needs. Modifications of this nature should be checked for consistency with the unabbreviated UNFC-2009 and other applications in use.

Figure 3

UNFC-2009 classes and sub-classes defined by sub-categories^a

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 ^b	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	Potential Deposit	Exploration Projects	[No sub-classes defined] ^c	3.2	3	4
		Additional Quantities in Place		3.3	4	4

^a Refer also to the notes for Figure 2.^b Development Pending Projects may satisfy the requirements for E1.^c Generic sub-classes have not been defined here, but it is noted that in petroleum the terms Prospect, Lead and Play are commonly adopted.

ANNEX I^a

DEFINITION OF CATEGORIES AND SUPPORTING EXPLANATIONS

Category	Definition ^b	Supporting Explanation ^c
E1	Extraction and sale has been confirmed to be economically viable. ^d	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. ^d	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. ^d	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.

^a Annex I forms an integral part of UNFC-2009.

^b The term “extraction” is equivalent to “production” when applied to petroleum.

^c The term “deposit” is equivalent to “accumulation” or “pool” when applied to petroleum.

^d 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.

Category	Definition	Supporting Explanation
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.	<p>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.</p> <p>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.</p>
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.	

Category	Definition	Supporting Explanation
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.

Annex II^a

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.

^a Annex II forms an integral part of UNFC-2009.

ANNEX III^a

EXPLANATORY NOTE TO UNITED NATIONS FRAMEWORK CLASSIFICATION FOR FOSSIL ENERGY AND MINERAL RESERVES AND RESOURCES 2009 (UNFC-2009)

INTRODUCTION

By 2004, the Economic Commission for Europe (ECE)^b 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 for its consideration.

At its 42nd Plenary Meeting, on 16 July 2004, the Economic and Social Council^c, recalling its decision 1997/226 of 18 July 1997, welcomed the endorsement by ECE 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 ECE.

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

At its sixteenth session in November 2007, the Committee on Sustainable Energy directed the Ad Hoc 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, but does not form part of the classification itself.

^a Explanatory Note accompanies, but does not form part of, UNFC-2009.

^b ECE is one of the five regional commissions of the United Nations. It represents Europe, Central Asia, North America and Israel.

^c Resolution 2004/233 of the United Nations Economic and Social Council pertaining to the United Nations Framework Classification for Fossil Energy and Mineral Resources.

The UNFC Revision Task Force that prepared the UNFC-2009 proposal consisted of the Extended Bureau of the Ad Hoc Group of Experts, plus selected experts.

I. RELATIONSHIP TO OTHER CLASSIFICATIONS

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 view 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.

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 Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template of 2006 and 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) of 2007. In 2007 and 2008, the Ad Hoc 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 (ECE ENERGY SERIES No. 33 and ECE/ENERGY/71) recommended making some modifications to the UNFC to facilitate this.

UNFC-2009 reflects the recommendations of the Mapping Task Force by providing a high-level framework classification under which commodity-specific guidelines, such as reflected in the CRIRSCO Template and SPE-PRMS, can coexist. The generic high-level definitions have been developed to ensure maximum potential for alignment with other systems and to facilitate mapping with them. 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

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

The International Organization for Standardization (ISO) normative reference document ISO 1000:1992, SI Units (Système International d'Unités) and recommendations for the use of their multiples and certain other units, contains provisions which, through reference in this text, constitute provisions for 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 previously. For undated references, the latest edition of the normative document referred to applies. The members of ISO and the International Electrotechnical Commission (IEC) maintain registers of currently valid International Standards.

IV. COMMENTS TO UNFC-2009

The following comments refer to specific sections of the Classification. They are appended to the Classification for ease of reference.

[To Section I \(UNFC-2009\)](#)

This section states that the UNFC-2009 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.

Application of the UNFC-2009 to recipient reservoirs for permanent storage or for temporary inventory is not addressed in the classification.

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

[To Section II \(UNFC-2009\)](#)

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 \(UNFC-2009\)](#)

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

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.

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.

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 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. UNFC-2009 is fully compatible with both these practices.

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.

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.

“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.

Uncertainty is communicated in three complementary ways:

- (a) 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 characterization 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;

- (b) 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;
- (c) Except in the case of commercial projects, there may be a chance that development and production projects will not be realized. 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 materialize.

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

[To Sections IV and V \(UNFC-2009\)](#)

While the UNFC is a classification in its own right, its generic category definitions make it very suitable for comparing with other classifications through mapping modules, 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 \(UNFC-2009\)](#)

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.

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