

## AHGE Mapping Task Force Report – October 9, 2007

The United Nations Framework Classification (UNFC) is a universally applicable scheme for classifying petroleum and solid mineral (including energy minerals) reserves and resources. The Classification is designed to allow the incorporation of currently existing terms and definitions into this framework and thus to make them comparable and compatible. This approach has been simplified through the use of a three-digit code clearly indicating the essential characteristics of extractable energy and mineral commodities in market economies.

The AHGE has always recognised the need for supplementary guidelines to assist users in interpreting the UNFC beyond the definitions, but has refrained from developing these in order to retain flexibility to align with other systems. The AHGE requested the Society of Petroleum Engineers (SPE), on behalf of the petroleum industry, and the Committee for Mineral Reserves International Reporting Standards (CIRRSO), on behalf of the solid minerals industry, to compare their respective systems and the UNFC with a view to harmonizing terminology and providing the required guidelines.

In July 2007, the AHGE charged a special task force to prepare a draft mapping of the SPE, CIRRSO and UNFC systems. The task force was led by Ms. Mucella Ersöy and Mr. Per Blystad with Mr. Niall Weatherstone, Mr. Ferdi Camisani-Calzolari, Mr. John Etherington, Mr. Kirill Kavun, Mr. James Ross, and Mr. Andrej Subelj as members. The mandate stated:

*The team is to complete the mapping of the various classifications and definitions to the UNFC. Specifically, this will be the CIRRSO/JORC, New Russian Classification and SPE PRMS terminologies. The results of this initial effort can then be leveraged to support mapping of other national and international classification systems to the UNFC.*

*In doing this work, you are invited to consider the changes that will be required to bring the classifications and definitions together for wide acceptance and global adoption with UN support. This should include changes to the UNFC for minerals and for petroleum to align these on a project status based framework. It should also include recommended changes to the three underlying classifications for further consideration. It is important to recognise that it is costly to change any of the systems. It may therefore be wise, in the first instance to exploit flexibility inherent in the current systems in the form of specifications and guidelines that may affect practise within the current systems. Substantive changes to classifications and definitions would probably be best handled in the context of an International Financial Reporting Standard for extractive activities in order to avoid impacting existing reporting standards.*

SPE and CIRRSO had previously engaged in a similar exercise at the request of the International Accounting Standards Board (IASB) resulting in a detailed mapping between the CIRRSO Template and the SPE/WPC/AAPG/SPEE Petroleum Resources Management System (PRMS). The task force agreed to build on this initiative to preserve linkage to the IASB project.

The Task Force noted that the mandate invited consideration of changes that would be required to bring the classifications and definitions together for wide acceptance and global adoption with UN support. This should also include changes to the UNFC for minerals and for petroleum to align these on a project status based framework.

The task force recognised that the UNFC is in two parts, classes and categories. The combination of categories defines the classes of the classification. Several alternate classifications may be constructed by different combination of categories. Examples are classification of extraction projects and a classification of a deposit or an accumulation (both of which have been used intensively).

The Task Force recognized that the mapping of UNFC to other classification would be easier if the UNFC definitions of categories were simplified, which also would be appropriate for an umbrella classification. Further, it identified that a major strength of the UNFC is its numerical basis which helps to avoid issues related to language. The Task Force recommends that for clarity, the labels for categories and sub-categories to be removed. It would be sufficient to go from the numerical code to the full and comprehensive definition. Labels may still be required for the classes of the classification recommended for global application as is seen in the SPE PRMS and CRIRSCO classifications.

In addition to two different sets of labels, there are also two sets of definitions within the current version of the UNFC (i.e. one definition for solid minerals and one for petroleum). The Task Force recommends generic principle-based definitions for each of the categories and sub-categories and to explain the differences in application between solid minerals and petroleum in the form of additional commodity-specific guidelines.

The Task Force agreed that the definitions should be kept at a high level, in order to maintain continuity with the current definitions and to ensure maximum potential for alignment with other systems: it is the principles that are important at this level, not the specific details. However, the current definitions are, in places, very detailed and contain commodity-specific guidelines rather than generic definitions (see, for example, the current definition of G4 for solid minerals).

The Task Force have simplified the current definitions, to the extent possible, to a point where they incorporate the necessary principles for all commodities, without material deviation from their current meaning, and excluded detailed and/or commodity-specific information that could be captured in commodity-specific guidelines.

**Table 1 (attached)** compares the prior UNFC 2004 definitions for minerals and petroleum to the proposed generic description for each category and sub-category as contained in section 4 of the report.

Results of the task force's work are summarized in terms of recommended updates to the UNFC 2004 document:

- the solid minerals and petroleum mapping modules would replace sections 2 and 3.
- a revised category definitions table replaces section 4.

Adjustments to the CRIRSCO template and the SPE PRMS have not been considered, but it may well be that adjustments may further facilitate the development of a common global terminology. Further background **Discussion of Key Issues** that were considered in developing this report is separately attached.

It is envisaged that these revised mappings will form the basis of a hybrid system that allows users to conduct reserves and resources evaluations, report results within either of these systems and, using the mapping modules, also present results using UNFC codification. Further, these

mapping modules can serve as a “template” such that other national, industrial, and institutional level systems can be similarly mapped into UNFC codes and thus promote international communication and global assessments.

While it is outside the task force’s current mandate, it is recognized that significant revisions to section 1 are required to accommodate this mapping approach and, further, there is an opportunity to improve the overall structure of the document. It is recommended that a separate task force be charged to develop such a document incorporating the mapping modules.



# **United Nations Framework Classification for Fossil Energy and Mineral Resources**

**1.** Revisions to section 1 and restructuring of total UNFC 2004 document is recommended, this task deferred to a separate study.

## **2. The UNFC applied to Solid Minerals**

- 2.1 Solid Minerals Introduction
- 2.2 Mapping of Template to UNFC and Petroleum
- 2.3 Mapping based on Project Maturity Status
- 2.4 The CRIRSCO Template

## **3. The UNFC applied to Petroleum**

- 3.1 Petroleum Introduction
- 3.2 Mapping of SPE-PRMS to UNFC and Solid Minerals
- 3.3 SPE/WPC/AAPG/SPEE Petroleum Management System (PRMS)

## **4. Category Definitions**

## 2. The UNFC applied to Solid Minerals

### 2.1 Solid Minerals Introduction (section 2 is subject to review by CRIRSCO board)

The CRIRSCO Template of 2006 (hereinafter referred to as the “Template”) is the most recently developed international technical standard for the reporting of Exploration Results, Mineral Resources and Mineral Reserves. It is in turn based on a number of national or regional reporting standards that are compatible with each other and the Template and whose authors contributed to the development of the Template that represents current international best practice.

Figure 1 compares the Template’s two-dimensional and the UNFC’s three-dimensional classification matrices.

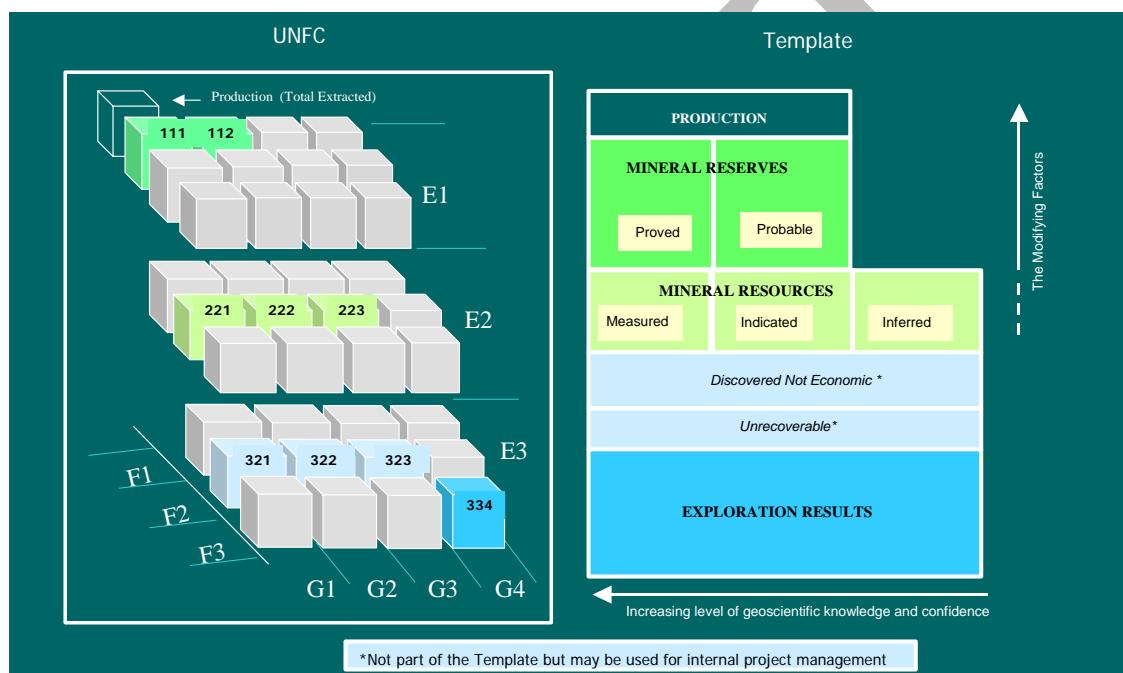


Figure 1: UNFC as applied to solid minerals

In the solid minerals system:

- Where exploration activities have taken place but are insufficiently advanced to estimate a Mineral Resource quantity, the generic term of Exploration Results is applied. Exploration Results are insufficient to determine the volume and quality of mineralisation and should not be confused with Mineral Resources.
- Where geological studies have been carried out and an estimate of the quantity of mineralisation is possible (volume, tonnes, grade etc) then classification takes place on the horizontal, geological, axis on the basis of the level of detail of the studies and the degree of confidence in the geological model.

- Mineral Resources are in situ estimates of mineralisation prior to conversion to Mineral Reserves (i.e. with no adjustments for mining dilution or losses). Mineral Reserves are generally quoted as the product of mining activities (tonnage and grade or quality) i.e. the quantities delivered to the processing plant. Where further processing is required to produce a saleable product, recovery or yield factors should be provided if the results are to be published.
- Conversion of resources to reserves requires technical studies of at least pre-feasibility level to demonstrate that all of the Modifying Factors<sup>1</sup> have been addressed and the results are positive. The Modifying Factors are broadly similar to the ‘contingencies’ described for petroleum in Section 3 and are reflected by the UNFC criteria to be met in the social and economic domain (the E-categories) and in the industrial and technical domain (the F categories).
- Where adequately detailed geological studies have been carried out but preliminary assessment of the Modifying Factors indicates that the project is not currently viable, mineral resources are not converted to mineral reserves but may be held in an inventory of ‘discovered not economic’ to be reviewed in future should conditions change.

## 2.2 Mapping of the Template to UNFC and Petroleum

Figure 2 shows the classification categories of the Template and their equivalents under the UNFC codification system.

Fundamental Characterization	Solid Mineral Classes	UNFC E axis	UNFC F axis	UNFC G axis		
				Proved	Probable	NA
DISCOVERED AND MINEABLE	MINERAL RESERVES	1	1	1	2	
				Measured	Indicated	Inferred
DISCOVERED AND NOT COMMERCIALLY RECOVERABLE	MINERAL RESOURCES	2.1	2	1	2	3
	Discovered Not Economic*	2.2	2	1	2	3
	Unrecoverable*	3	2	1	2	3
UNDISCOVERED	Exploration Results	3	3	4		
*Not part of the Template but may be used for internal project management						

Figure 2: UNFC to Template mapping

<sup>1</sup> The Modifying Factors comprise mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors.

Note that this diagram shows classes recognised for public disclosures in the Template in yellow shading. Additional classes beyond those defined in the Template but suitable for internal project management are shown in blue background. Classes may be adjusted in the future to accommodate other categories or sub-categories found useful, for example by governments.

## 2.3 Mapping based on project maturity status

The petroleum industry (see Section 4) relies heavily on project maturity status as a form of classification on the vertical access. While the increasing detail of studies from exploration through geological to feasibility studies is implicit in the Template, project maturity is not used as an explicit form of classification. Nevertheless, the project evaluation process undertaken in a minerals project is very similar to that of a project in petroleum. Figure 3 compares the most commonly used terminology for minerals project development stages with the UN and Petroleum equivalents.

UNFC F-axis		PRMS Sub-Classes	Template Classes	Mineral Project Development Stage
Category	Sub-category			
F1	F1.1	On Production	Mineral Reserves	On Production (1)
	F1.2	Approved for Development		Project Implementation
	F1.3	Justified for Development		Feasibility Study (2)
F2	F2.1	Development Pending	Mineral Resources	Pre-Feasibility Study (3)
	F2.2	Development Unclarified or on Hold		Order of Magnitude Studies (4)
	F2.3	Development not Viable		(5, 6)*
	F2.4	Discovered Unrecoverable		
F3	F3.1	Prospect	Exploration Results	Conceptual Studies (7)
	F3.2	Lead		
	F3.3	Play		
	F3.4	Undiscovered Unrecoverable		(6)*

\*Not part of the Template but may be used for internal project management

Figure 3: Project development status mapping

Notes:

1. On or in production is equivalent across all three systems
2. Project approval is usually made at senior management level and corresponds to the end of a feasibility study which is sufficiently detailed to provide an accurate assessment of the technical and economic viability of the project. Economic projects are those where cash flow schedules generate a positive net present value under a defined discount rate; the same definition applies to petroleum and mineral projects. After approval, the project will move into the implementation stage. Minerals companies may report reserves as developed or undeveloped if regulators require it. This detail would be dealt with in specifications to the classification.

3. Pre-feasibility studies will be sufficiently detailed to enable a decision to abandon or defer the project or move to the feasibility stage. Reserves are usually (but not always) publicly declared following a pre-feasibility study provided the study has adequately addressed the modifying factors and no significant impediments to development have been identified. Timing to physical implementation is not considered as critical as in petroleum projects, with long lead times to production being common. However, studies would be refreshed periodically to ensure that reserves remain viable.
4. Mineral Resources have realistic prospects of eventual economic extraction which is taken to mean under realistic assumptions of future prices, recovery and other inputs. To reach the equivalent of development pending, pre-feasibility studies will usually be in progress, while order of magnitude studies will be sufficient to make the decision whether to continue to pre-feasibility. “Unclarified or on hold” would generally mean that studies were in progress or inconclusive although preliminary economic indications remain favourable.
5. Order of Magnitude studies based on advanced exploration will generally be adequate to determine if the project is likely to be viable and whether it should move to pre-feasibility. Projects that are not viable under currently assumed conditions may be placed in a mineral inventory pending future re-evaluation.
6. Material that is deemed to be permanently unrecoverable, for example in rock pillars left behind to support major infrastructure such as shafts, will be removed from resources entirely.
7. Predicted but undiscovered petroleum in the PRMS classification (Prospective Resources) is equivalent to early indications of mineralization classified as Exploration Results under the Template. Exploration Results may be publicly reported but not as estimates of tonnes and grade due to the inadequate available data. Any estimates of potential tonnage and grade will be speculative and may be based on analogous geological settings. These may be useful for internal planning and prioritisation of exploration effort but are not relevant to the CRIRSCO classification which is focused on the public release of information. Because of the lack of available data, studies that may be carried out to form a preliminary view on project viability, or to guide future exploration, are likely to be only conceptual in nature.

Section 4 provides an expanded mapping of CRIRSCO and PRMS systems keyed to UNFC E, F, and G categories.

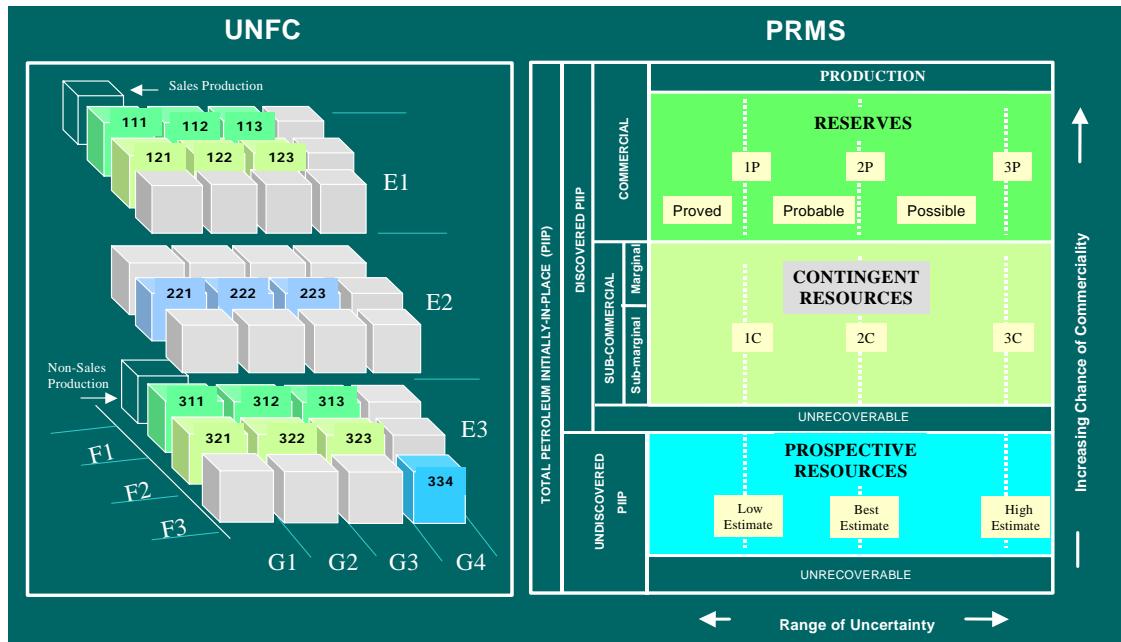
## 2.4 The CRIRSCO Template

This document is maintained by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) on their website at: <http://www.crirsco.com>. Combined with the above mapping, these guidelines may be applied to evaluations with results reported using the UNFC system.

## 3.0 The UNFC applied to Petroleum

### 3.1 Petroleum Introduction (section 3 is subject to review by SPE OGRC)

The SPE/WPC/AAPG/SPEE Petroleum Resources Management System of 2007 (hereinafter referred to as “PRMS”) is the most recently developed international technical standard for petroleum evaluations.



**Figure 4. UNFC as applied to petroleum**

Figure 4 compares the PRMS two-dimensional and the UNFC’s three-dimensional classification matrices. In PRMS:

- Quantities are classified on the vertical axis according to a combination of the development project’s economic viability and evaluation maturity expressed as chance of commerciality.
- Quantities are categorized on the horizontal axis based on certainty of estimated sales quantities derived from each project. Estimates of sales quantities reflect a combination of the uncertainty of hydrocarbons initially-in place and the recovery efficiency of the applied development program.
- Multiple projects may be applied to an accumulation with the ultimate recovery being the combination of the quantities recovered by each project.
- All quantities are as measured at defined transfer points; these are the upstream petroleum “sales products” (crude oil, condensate, natural gas, natural gas liquids) delivered for distribution or further downstream refining.
- Quantities may only be classified as Reserves if the associated project is commercial, that is, both economic and committed for development. Reserves classification implies that there are

no significant contingencies that would preclude implementation and there should be documented intent to initiate development of such projects within a reasonable time frame (timing may vary according to specific circumstances).

- Contingent Resources have an associated chance of success that may be expressed qualitatively through assignment to maturity-based sub-classes or quantitatively through assigning a percentage chance of development through to Reserves status.
- Quantities classified as Contingent Resources are sub-classified as Marginal and Sub-marginal based principally on project economics but may also be influenced by other commercial contingencies (contingencies are broadly equivalent to CRIRSCO's "Modifying Factors").
- Quantities associated with "Marginal" Contingent Resources projects are in a discovered accumulation but can not be classified as Reserves since commitment to develop has not been demonstrated because of one or more of the following reasons:
  - Project is economic but priorities cause significant deferment of development.
  - One or more necessary conditions prevent development (e.g. regulatory issues).
  - Economic development is contingent on positive changes in conditions (price, technology, etc.) that can be reasonably forecast.
  - Initial results indicate an economic project but additional information is required to make a final evaluation.
- Quantities associated with "Sub-marginal" Contingent Resources projects are in a discovered accumulation but:
  - Initial results indicate that the project is sub-economic but additional information is required to make a final evaluation.
  - No technically and/or economically viable development plan can be defined without invoking very significant, but feasible, improvements in future conditions.
- Where no feasible recovery project is proposed, those in-place quantities assigned to a discovered, or predicted in an undiscovered, accumulation are classified as "Unrecoverable".
- Quantities within the Prospective Resources class are interpreted to be recovered from undiscovered accumulations by a defined preliminary development program but there is a significant associated risk of project failure, that is, no discovery will be confirmed. In the event that a discovery is confirmed, the project moves to Contingent Resources but is still subject to chance of commercial development.

### **3.2 Mapping of SPE-PRMS to UNFC and Solid Minerals**

The commerciality axis in PRMS implicitly combines economic and project maturity status information. Sub-classification options within PRMS are available to disaggregate commerciality into its components and can be used as the basis for mapping between the PRMS, UNFC, and Solid Minerals classification systems. Figure 5 provides a high level mapping based primarily on project economic status. Compared to the Solid Minerals Classification (Section 2, figure 2):

- The petroleum Marginal Contingent Resources are the class equivalent of Mineral Resources.

- Sub-Marginal Contingent Resources represent an internal inventory of currently uneconomic projects to be periodically reviewed for development potential and is similar to “Discovered Not Economic” in the minerals system.
- Prospective Resources are the class equivalent of Exploration Results

Fundamental Characterization	PRMS Resources Classes	UNFC E axis	UNFC F axis	UNFC G axis		
				Proved	Probable	Possible
DISCOVERED AND COMMERCIALLY RECOVERABLE	RESERVES	1	1	1	2	3
DISCOVERED AND NOT COMMERCIALLY RECOVERABLE	CONTINGENT RESOURCES	Marginal Sub-Marginal Unrecoverable	2.1 2.2 3	2	C1 1 2	C2 3
UNDISCOVERED	PROSPECTIVE RESOURCES	3 Unrecoverable	3	3	4.1 4.2	4.3

**Figure 5: High Level Mapping PRMS and UNFC Classifications**

PRMS defines incremental uncertainty categories of Proved and Probable Reserves mapped to Proved and Probable Mineral Reserves categories. In the petroleum system, Possible quantities are included in high estimates of in-place and project recovery efficiency; in the minerals industry geologic control is considered insufficient to define Mineral Reserves and these high estimates would be included in Inferred Mineral Resources. While PRMS does not define incremental uncertainty terminology for Contingent Resources, the terms C1/C2/C3 as used herein are considered to align with Proved, Probable and Possible regarding confidence levels. Then, C1/C2/C3 Marginal Contingent Resources Reserves are generally equivalent to Measured/Indicated/Inferred Mineral Resources in terms of uncertainty; however, the quantities estimated are those that can be recovered and sold under a defined development project while Mineral Resources are defined in terms of in situ tonnage and grade prior to mine design.

Figure 6 provides more detailed mapping to UNFC including sub-categorization based primarily on project status (PRMS sub-classes). Many of these sub-classes are unique to petroleum evaluations and may have no direct equivalents in the CRIRSCO classification system.

For Reserves to be attributed, projects are required to meet the evaluator’s normal economic hurdles based on reasonable assumptions of forecast conditions (E1.1). E1.2 describes projects that may be currently uneconomic due to short periods of abnormally low prices or where operational problems create abnormal high costs; it also applies to projects that are sustained by government or other subsidies.

Projects classified as Marginal Contingent Resources may be technically and economically feasible (E1.1) but awaiting resolution of other contingencies (e.g. environmental permits) or may require realistically forecast positive improvements in conditions (E2.1). Sub-marginal Contingent Resources require significant, but feasible, improvements in conditions (E2.2). Where

project evaluations of discovered accumulations are not sufficiently complete to define ultimate commerciality, the economic status is “undetermined” (E3.2). Non-sales quantities (lease fuel, flare and losses) are assigned to E3.1 and may be associated with projects at all stages of maturity.

Fundamental Characterization	PRMS Resources Classes	PRMS Sub-Classes	UNFC E axis	UNFC F axis	UNFC G axis		
					1P/1C low est	2P/2C best est	3P/3C high est
DISCOVERED AND COMMERCIALLY RECOVERABLE	RESERVES	On Production	1.1 or 1.2	1.1	1	1+2	1+2+3
		Approved for Development	1.1 or 1.2	1.2	1	1+2	1+2+3
		Justified for Development	1.1 or 1.2	1.3	1	1+2	1+2+3
DISCOVERED AND NOT COMMERCIALLY RECOVERABLE	CONTINGENT RESOURCES	Development Pending	1.1 or 2.1	2.1	1	1+2	1+2+3
		Development Unclarified or On Hold	3.2 or 1.1 or 2.1	2.2	1	1+2	1+2+3
		Development not Viable	2.2	2.3	1	1+2	1+2+3
		Unrecoverable	3.3	2.4	1	1+2	1+2+3
UNDISCOVERED	PROSPECTIVE RESOURCES	Prospect	3.2	3.1	4.1	4.1+4.2	4.1+4.2+4.3
		Lead	3.2	3.2	4.1	4.1+4.2	4.1+4.2+4.3
		Play	3.2	3.3	4.1	4.1+4.2	4.1+4.2+4.3
		Unrecoverable	3.3	3.4	4.1	4.1+4.2	4.1+4.2+4.3

**Figure 6: Detailed Mapping PRMS and UNFC Classifications**

While detailed development plans may be envisaged for undiscovered accumulations complete with production/sales profiles, cash flow schedules and economic analyses, given the associated risk of failure, the economic status remains undetermined (E3.2). Unrecoverable quantities, discovered or undiscovered, estimated to remain in-place after the completion of all development and production projects are designated as E3.3.

Petroleum projects may be further sub-classified by their maturity being a qualitative indicator of decreasing chance of commerciality. Reserves sub-classes are: On Production (1.1), Approved for Development (1.2), and Justified for Development (1.3). Contingent Resources sub-classes are Development Pending (2.1), Development Unclarified or On Hold (2.2), and Development Not Viable (2.3). While the latter discoveries have no current development plans, they are retained in inventory pending dramatic, unforeseen, but feasible improvements in conditions. Unrecoverable Discovered quantities are codified as F2.4.

Projects in undiscovered accumulations are also sub-classified based on exploration project maturity as Prospects (F3.1), Leads (F3.2) or Plays (F3.3). Associated quantities that are predicted to exist but are not considered recoverable under any technically feasible development plan are classified as Unrecoverable (F3.4).

Petroleum project evaluations may use combinations of deterministic and probabilistic methods with resulting sales quantities expressed in both incremental and cumulative terms. Figure 7 maps certainty categories in terms of PRMS cumulative scenarios: 1P/2P/3P for Reserves where 1P = Proved (G1), 2P = Proved plus Probable (G1+G2), and 3P = Proved plus Probable plus Possible

(G1+G2+G3); equivalent cumulative scenarios for Contingent Resources are 1C/2C/3C and for Prospective Resources are low/best/high estimates.

When the range of uncertainty is represented by a probability distribution, a low, best, and high estimate shall be provided such that:

- There should be at least a 90% probability (P90) that the quantities actually recovered will equal or exceed the low estimate.
- There should be at least a 50% probability (P50) that the quantities actually recovered will equal or exceed the best estimate.
- There should be at least a 10% probability (P10) that the quantities actually recovered will equal or exceed the high estimate.

For quantities forecast to be recovered from undiscovered accumulations, typically low, best and high estimates are developed as part of the evaluation and the associated quantities may be defined as G4.1, G4.1+G4.2, and G4.1+G4.2+G4.3 scenarios. In probabilistic assessments, these estimates are aligned with the P90/P50/P10 from distribution of predicted sales volumes. Where only a single deterministic best estimate is developed, it is deemed to be G4.1+G4.2. All estimates are conditional on chance of discovery; conditional results may be expressed as a risked best estimate or risked mean.

Those quantities classified as Reserves may be further allocated to Developed (Producing and Non-Producing) and Undeveloped according to funding and operational status of related wells and facilities. Such allocations are represented by assigning quantities to sub-categories on the Feasibility Axis as in Figure 7.

Fundamental Characterization	PRMS Class	PRMS Sub-Classes	UNFC F axis			UNFC G axis		
			Developed		Undeveloped	1P	2P	3P
			Producing	Non-Producing				
DISCOVERED AND COMMERCIALLY RECOVERABLE	RESERVES	On Production	1.1.1.1	1.1.1.2	1.1.2	1	1+2	1+2+3
		Approved for Development	NA	1.2.1.2	1.2.2	1	1+2	1+2+3
		Justified for Development	NA	NA	1.3.2	1	1+2	1+2+3

**Figure 7: UNFC Codification for Developed and Undeveloped Reserves**

Section 4 provides an expanded mapping of CRIRSCO and PRMS systems keyed to UNFC E, F and G categories.

### 3.3 SPE/WPC/AAPG/SPEE Petroleum Resources Management System

This document is maintained by the Society of Petroleum Engineers (SPE) on their website at: <http://www.spe.org/spe-app/spe/industry/reserves/index.htm>. Combined with the above mapping, these guidelines may be applied to evaluations with results reported using the UNFC system.

## Section 4: Category Definitions

UNFC category definitions are generically applicable regardless of commodity. Solid Minerals and Petroleum definitions herein align with terminology utilized in CRIRSCO and SPE-PRMS respectively.

Cat.	UNFC Definitions	CRIRSCO Template	SPE-PRMS
<b>E1</b>	Extraction and sale is economically viable.  Refer to definitions of E1.1 and E1.2.	E1 without a sub-category refers to Mineral Reserves. Applied where extraction is technically and economically viable.	Applied to projects for which production and sales are economic.
<b>E1.1</b>	Extraction and sale is economically viable on the basis of realistic assumptions of future market conditions.	Appropriate assessments and studies should have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.  The term 'economically mineable' implies that extraction of the Mineral Reserve has been demonstrated to be viable under reasonable financial assumptions.	There should be a reasonable assessment of the future economics of such development projects meeting defined investment and operating criteria; a reasonable expectation that there will be a market for all or at least the expected sales quantities of production required to justify development; evidence that legal, contractual, environmental and other social and economic concerns will allow for the actual implementation of the recovery project being evaluated.
<b>E1.2</b>	Extraction and sale is economic in spite of current adverse market conditions that are expected to be of a short-term nature if long-term forecasts remain economic. Extraction that is deemed to be economic as a consequence of subsidies also falls into this sub-category.	Applies to projects where interim negative net cash flows are accommodated for short periods provided that the longer-term forecasts still indicate positive economics. Examples of such situations might be commodity price fluctuations expected to be of short duration, mine emergency of a non-permanent nature, transport strike etc. It may also apply where company management has made a deliberate decision to operate on a non-economic basis or where extraction is deemed to be economic as a consequence of government subsidies.	Applies to projects where interim negative net cash flows are accommodated in short periods of low product prices or major operational problems, provided that the longer-term forecasts must still indicate positive economics.  E1.2 may also be applied where production is economic as a consequence of government subsidies.

<b>E2</b>	Economic extraction has not been fully demonstrated to be economically viable.  Refer to definitions of E2.1 and E2.2.	E2 without a sub-category refers to an identified concentration or occurrence of material of economic interest in or on the Earth's crust where studies have not yet validated a mining plan.	Applied to projects which have reasonable prospects for eventual economic production but are not currently commercial due to one or more contingencies.
<b>E2.1</b>	Extraction has not yet been fully demonstrated to be economic, but on the basis of realistic assumptions of future market conditions, it is more likely than not that economic extraction will take place in the foreseeable future.	E2.1 refers to Mineral Resources: A concentration or occurrence of material of economic interest in or on the Earth's crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction but the modifying factors have not been fully addressed.	Applied to those quantities associated with technically feasible projects that are marginally commercial; that is, are either currently economic or projected to be economic under reasonably forecasted improvements in commercial conditions but are not committed for development because of one or more contingencies.
<b>E2.2</b>	Extraction and sale is not economically viable on the basis of realistic assumptions of future market conditions, and eventual economic extraction would require a substantially higher commodity price or a major reduction in costs to render it economic	Portions of an identified mineral deposit that do not have reasonable prospects for eventual economic extraction. Any mineralization categorized as E2.2 relates to material that should not be publicly reported but which may be retained in inventories pending future changes in technical or economic circumstances that would enable a re-assessment.	Applied where projects are sub-marginal commercial; that is, quantities that are associated with discoveries for which analysis indicates that technically feasible development projects would not be economic and/or other contingencies would not be satisfied under current or reasonably forecasted improvements in commercial conditions. These projects nonetheless should be retained in the inventory of discovered resources pending unforeseen major changes in commercial conditions.
<b>E3</b>	Extraction is not available for sales, or is not economic to extract or economic viability has not yet been determined.  Refer to definitions of E3.1, E3.2 and E3.3.	E3 without a sub-category refers to Exploration Results where work is insufficiently advanced to determine economic	Quantities that are of undetermined economic viability or are of no economic interest.
<b>E3.1</b>	Extraction without sale.	Material that may be extracted in the course of mining but which is currently uneconomic and therefore will not be sold. Such material may include dumps of low grade material that may become economic in future.	Within petroleum projects, non-sales quantities (lease fuel, flare, and losses) should be separately identified and documented in addition to sales quantities for both production and recoverable resource estimates.

<b>E3.2</b>	Economic viability of extraction has not yet been determined.	Where evaluation is in progress such that it is premature to estimate a mineralized volume or to determine the ultimate chance of economic viability, it is acceptable to note that economic status is "undetermined."	Where evaluations are incomplete such that it is premature to clearly define ultimate chance of commerciality, it is acceptable to note that project economic status is "undetermined."
<b>E3.3</b>	Estimated quantities that are in-situ, but where there is currently considered to be no potential for eventual economic extraction.	Applied to in-situ mineralization with no potential for eventual economic extraction (e.g. where the material will be sterilized in permanent pillars).	That portion of Discovered or Undiscovered Petroleum Initially-in-Place quantities which are estimated, as of a given date, not to be recoverable.
<b>F1</b>	A development project that has been demonstrated to be technically and commercially feasible  Refer to definitions of F1.1, F1.2 and F1.3.	F1 without a sub-category refers to Mineral Reserves.  Feasibility Studies have demonstrated extraction of the reported quantities to be justified.  Cost data must be reasonably accurate and no further investigations should be necessary to make the investment decision.	Development and/or production plans demonstrate production of the reported quantities to be justified.  PRMS defines sub-classes based on project maturity (chance of commerciality).  Sub-categories may be added under appropriate Reserves sub-classes for optional petroleum usage: (Developed Producing, Developed Non-producing and Undeveloped.)
<b>F1.1</b>	The project is currently extracting products.	Not explicitly defined in the Template; referring to project status rather than the classification of reserves. The project is currently producing and selling minerals to market.	<b>On Production:</b> The project is currently producing and selling petroleum to market.
<b>F1.2</b>	All necessary approvals have been obtained, capital funds have been committed, and implementation of the development project is under way.	Not explicitly defined in the Template; referring to project status rather than the classification of reserves. All necessary approvals have been obtained, capital funds have been committed, and implementation of the development project is under way.	<b>Approved for Development:</b> All necessary approvals have been obtained, capital funds have been committed, and implementation of the development project is under way.
<b>F1.3</b>	Implementation of the development project is justified on the basis of reasonable forecast commercial conditions at the time of reporting, and there are reasonable expectations that all necessary approvals/contracts will be obtained.	Implementation of the project has been demonstrated to be justified by detailed pre-feasibility or feasibility studies based on reasonable forecast commercial conditions at the time of reporting, and there are reasonable expectations that all necessary approvals/contracts	<b>Justified for Development:</b> Implementation of the development project is justified on the basis of reasonable forecast commercial conditions at the time of reporting, and there are reasonable expectations that all necessary approvals/contracts will be obtained.

<b>F2</b>	A development project that has not yet been demonstrated to be technically and commercially feasible.	F2 without a sub-category refers to a Mineral Resource. Geological studies have been completed that identify a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics are known, estimated or interpreted from specific geological evidence and knowledge	Projects that do not meet the criteria for commerciality.  PRMS defines sub-classes based on project maturity.
<b>F2.1</b>	Project activities are ongoing to justify commercial development in the foreseeable future.	NA	<b>Development Pending:</b> A discovered accumulation where project activities are ongoing to justify commercial development in the foreseeable future.
<b>F2.2</b>	Project activities are on hold and/or justification as a commercial development may be subject to significant delay.	NA	<b>Development Unclarified or On Hold:</b> A discovered accumulation where project activities are on hold and/or where justification as a commercial development may be subject to significant delay.
<b>F2.3</b>	There are no current plans to develop or to acquire additional data at the time due to limited potential.	NA	<b>Development Not Viable:</b> A discovered accumulation for which there are no current plans to develop or to acquire additional data at the time due to limited production potential.
<b>F2.4</b>	No technically and/or commercially feasible extraction project is currently defined.	NA	<b>Discovered Unrecoverable</b> That portion of identified originally in-place petroleum quantities that have not been produced nor are forecast to be produced in the future by currently defined development programs.
<b>F3</b>	Project evaluation is incomplete or lacks sufficient definition to establish technical and commercial feasibility.	F3 without a sub-category refer to Exploration Results which comprise data and information generated by exploration programmes and early stage geological assessments. The quantity of data available is generally not sufficient to allow any reasonable estimates of tonnage and grade to be made. Examples include discovery outcrops, single drill hole intercepts or the results of geophysical surveys.	Project evaluation is incomplete or lacks sufficient definition to establish feasibility. This includes projects aiming to identify the presence of petroleum accumulation(s)  When applied to undiscovered accumulations, sub-classes may be defined based on exploration project maturity: Prospect, Lead and Play (F3.1, F3.2, and F3.3). F3.4 is used for Undiscovered Unrecoverable.

<b>G1</b>	Quantities associated with a known deposit that can be estimated with a high level of confidence.	<b>Measured Mineral Resource:</b> That part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence at both a global (deposit) and local (bench or mine production period) scale.	<b>Proved Reserves:</b> If deterministic methods are used, there should be a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate. The same uncertainty logic applies to 1C Contingent Resources and low estimate Prospective Resources conditional on discovery and development.
<b>G2</b>	Quantities associated with a known deposit that can be estimated with a reasonable level of confidence.	<b>Indicated Mineral Resource</b> Detailed geological studies have been carried out such that a reasonable confidence exists in the resource estimate at a local (bench or mine period) scale and high confidence exists in the resource estimate at a global (deposit) scale.	<b>Probable Reserves:</b> Those additional Reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves. It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate. The same uncertainty logic applies to 2C Contingent Resources and best estimate Prospective Resources conditional on discovery and development.
<b>G3</b>	Quantities associated with a known deposit that can be estimated with a low level of confidence.	<b>Inferred Mineral Resource:</b> That part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence, sampling and assumed but not verified geological and /or grade continuity. G3 requires sufficient general geological information to provide a reasonable confidence in the resource estimate at a global (whole of mine or deposit	<b>Possible Reserves:</b> The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (3P), which is equivalent to the high estimate scenario. When probabilistic methods are used, there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate. The same uncertainty logic applies to 3C Contingent Resources and high estimate Prospective Resources conditional on discovery and development.

<b>G4</b>	Estimated quantities associated with a potential, but not yet confirmed deposit.	Based on preliminary reconnaissance to identify areas of enhanced mineral potential on a regional scale based primarily on results of regional geological studies, regional geological mapping, airborne and indirect methods, preliminary field inspection, as well as geological inference	G4 is applied estimates of potential recoveries from undiscovered accumulations assuming a defined development plan. If low, best and high scenarios are developed as part of the evaluation, the associated quantities may be defined as G4.1, G4.1+G4.2, and G4.1+G4.2+G4.3 estimates to indicate that these are conditional on discovery. Where probabilistic methods are used, these scenarios should align with P90/P50/P10 from a distribution truncated at a minimum economic field size and the best estimate is the mean. Where a single deterministic best estimate is reported, it is deemed to be G4.1+ G4.2. All such estimates should be accompanied by an estimated chance of discovery. Results may be expressed as a risked best estimate or risked mean.
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