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**High-level mapping of the United Nations International Framework Classification for Reserves/Resources – Solid Fuels and Mineral Commodities of 1997 to the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009****Note by the secretariat**

The following tables and discussions are provided as a guide to the relationship between the United Nations International Framework Classification for Reserves/Resources – Solid Fuels and Mineral Commodities of 1997 (UNFC-1997) (ENERGY/WP.1/R.77<sup>1</sup>) and the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) (ECE Energy Series No.39). The comparison focusses on the changes to the definitions of the individual categories for each of the three axes of the UNFC system. The UNFC-2009 category definitions reflect general principles rather than more specific and detailed requirements of UNFC-1997, such as the existence of a specific type of report. In most cases, but not all, the intention is that the two definitions are aligned in terms of level of knowledge and/or confidence.

Since UNFC-1997 addressed solid fuels and mineral commodities only, this document makes reference to the definitions found in the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template of 2006<sup>2</sup> to which UNFC-2009 is aligned for such commodities. Particular care is required to avoid assuming that reserve and resource terminology can be used as a correlation tool between the two versions of the UNFC.<sup>3</sup> Reference must be made to the individual category definitions, as reproduced in this document, in every case.

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<sup>1</sup> United Nations Economic Commission for Europe (ECE) multilingual publication in Chinese, English, French, German, Portuguese, Russian and Spanish.

<sup>2</sup> CRIRSCO Template (2006) available at: [http://www.crirSCO.com/crirSCO\\_template\\_v2.pdf](http://www.crirSCO.com/crirSCO_template_v2.pdf).

<sup>3</sup> For example, the terms Measured, Indicated and Inferred Mineral Resource were applied to 331, 332 and 333 respectively under UNFC-1997, whereas under the UNFC-2009 definitions they are now aligned with 221, 222 and 223.

## High-Level Mapping of UNFC-1997 to UNFC-2009: E axis

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
E1	Quantities, reported in tonnes/volume with grade/quantity, demonstrated by means of a Prefeasibility Study, Feasibility Study or Mining Report, in order of increasing accuracy, that justify extraction under the technological, economic, environmental and other relevant conditions, realistically assumed at the time of the determination	Extraction and sale has been confirmed to be economically viable. <sup>4</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.	No material change, other than being based on principles rather than a specific (defined) type of report.
E2	Quantities, reported in tonnes/volume with grade/quantity, demonstrated by means of a Prefeasibility Study, Feasibility Study or Mining Report, in order of increasing accuracy, not justifying extraction under the technological, economic, environmental and other relevant conditions, realistically assumed at the time of the determination, but possibly so in the future.	Extraction and sale is expected to become economically viable in the foreseeable future. <sup>3</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.	No material change, unless E2 (1997) included quantities for which there were no reasonable prospects for economic extraction and sale in the foreseeable future (i.e. they would fail the CRIRSCO definition for Mineral Resources). These would now be classified as E3 (2009).
E3	Quantities, reported in tonnes/volume with grade/quantity, estimated by means of a Geological Study to be of intrinsic economic interest Since the Geological Study includes only a preliminary evaluation of Economic Viability, no distinction can be made between economic and potentially economic.	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>4</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.	No material change, since E3 (1997) would be consistent with: “economic viability of extraction cannot yet be determined due to insufficient information”. E3 (2009) also includes uneconomic quantities and those that will be extracted but not sold.

<sup>4</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.

## High-Level Mapping of UNFC-1997 to UNFC-2009: F axis

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
F1	<p>A Mining Report is understood as the current documentation of the state of development and exploitation of a deposit during its economic life including current mining plans. It is generally made by the operator of the mine. The study takes into consideration the quantity and quality of the minerals extracted during the reporting time, changes in Economic Viability categories due to changes in prices and costs, development of relevant technology, newly imposed environmental or other regulations, and data on exploration conducted concurrently with mining.</p> <p>It presents the current status of the deposit, providing a detailed and accurate up-to date statement on the reserves and the remaining resources.</p> <p>A Feasibility Study assesses in detail the technical soundness and Economic Viability of a mining project, and serves as the basis for the investment decision and as a bankable document for project financing. The study constitutes an audit of all geological, engineering, environmental, legal and economic information accumulated on the project. Generally, a separate environmental impact study is required.</p> <p>Cost data must be reasonable accurate (usually within <math>\pm 10\%</math>), and no further investigations should be necessary to make the investment decision. The information basis associated with this level of accuracy comprises the reserve figures based on the results of Detailed Exploration, technological pilot tests and capital and operating cost calculations such as quotations of equipment suppliers.</p>	<p>Feasibility of extraction by a defined development project or mining operation has been confirmed.</p>	<p>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.</p>	<p>F1 (2009) is based on the principle of having undertaken sufficient studies to demonstrate that the project can proceed, rather than linking it to a specific (defined) type of study. In some cases, projects may be implemented on the basis of a Prefeasibility study and these would change from F2 (1997) to F1 (2009). Any mining project that satisfies the CRIRSCO definition for Mineral Reserves would be F1 (2009).</p>

## High-Level Mapping of UNFC-1997 to UNFC-2009: F axis continued

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
F2	<p>A Prefeasibility Study provides a preliminary assessment of the Economic Viability of a deposit and forms the basis for justifying further investigations (Detailed Exploration and Feasibility Study). It usually follows a successful exploration campaign, and summarizes all geological, engineering, environmental, legal and economic information accumulated to date on the project.</p> <p>In projects that have reached a relatively advanced stage, the Prefeasibility Study should have error limits of <math>\pm 25\%</math>. In less advanced projects higher errors are to be expected. Various terms are in use internationally for Prefeasibility Studies reflecting the actual accuracy level. The data required to achieve this level of accuracy are reserves/resources figures based on Detailed and General Exploration, technological tests at laboratory scale and cost estimates e.g. from catalogues or based on comparable mining operations.</p> <p>The Prefeasibility Study addresses the items listed under the Feasibility Study, although not in as much detail.</p>	Feasibility of extraction by a defined development project or mining operation is subject to further evaluation	<p>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.</p>	No material change, other than being based on principles rather than a specific (defined) type of report. However, note that any mining project that satisfies the CRIRSCO definition for Mineral Resources would be F2 (2009) rather than F3 (1997).
F3	A Geological Study is an initial evaluation of Economic Viability. This is obtained by applying meaningful cut-off values for grade, thickness, depth, and costs estimated from comparable mining operations.	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.	No material change, other than being based on principles rather than a specific (defined) type of report. See comments for F2.

**High-Level Mapping of UNFC-1997 to UNFC-2009: F axis continued**

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
F3	<p>Economic Viability categories, however, cannot in general be defined from the Geological Study because of the lack of detail necessary for an Economic Viability evaluation. The resource quantities estimated may indicate that the deposit is of intrinsic economic interest, i.e. in the range of economic to potentially economic.</p> <p>A Geological Study is generally carried out in the following main stages: Reconnaissance, Prospecting, General Exploration and Detailed Exploration (for definition of each stage see below). The purpose of the Geological Study is to identify mineralization, to establish continuity, quantity, and quality of a mineral deposit, and thereby define an investment opportunity.</p>			
F4	N/a.	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.	A new category for 2009.

**High-Level Mapping of UNFC-1997 to UNFC-2009: G axis**

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
G1	Detailed Exploration involves the detailed three-dimensional delineation of a known deposit achieved through sampling, such as outcrops, trenches, boreholes, shafts and tunnels. Sampling grids are closely spaced such that size, shape, structure, grade, and other relevant characteristics of the deposit are established with a high degree of accuracy. Processing tests involving bulk sampling may be required. A decision whether to conduct a Feasibility Study can be made from the information provided by Detailed Exploration.	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	No material change provided that the level of geological knowledge and confidence is equivalent to that defined by CRIRSCO for a Measured Mineral Resource
G2	General Exploration involves the initial delineation of an identified deposit. Methods used include the surface mapping, widely spaced sampling, trenching and drilling for preliminary evaluation of mineral quantity and quality (including mineralogical tests on laboratory scale if required), and limited interpolation based on indirect methods of investigation. The objective is to establish the main geological features of a deposit, giving a reasonable indication of continuity and providing an initial estimate of size, shape, structure and grade. The degree of accuracy should be sufficient for deciding whether a Prefeasibility Study and Detailed Exploration are warranted.	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	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.	No material change provided that the level of geological knowledge and confidence is equivalent to that defined by CRIRSCO for an Indicated Mineral Resource. Otherwise, the quantities should be assigned as G3 (2009). Also, note that G2 can apply to a part of a deposit that also has a part that satisfies G1, since the level of “exploration” may not be the same over the whole deposit.

## High-Level Mapping of UNFC-1997 to UNFC-2009: G axis continued

<i>Category</i>	<i>1997 Definition</i>	<i>2009 Definition</i>	<i>2009 Supporting Explanation</i>	<i>Discussion</i>
G3	Prospecting is the systematic process of searching for a mineral deposit by narrowing down areas of promising enhanced mineral potential. The methods utilized are outcrop identification, geological mapping, and indirect methods such as geophysical and geochemical studies. Limited trenching, drilling, and sampling may be carried out. The objective is to identify a deposit which will be the target for further exploration. Estimates of quantities are inferred, based on interpretation of geological, geophysical and geochemical results.	Quantities associated with a known deposit that can be estimated with a low level of confidence.		No material change provided that the level of geological knowledge and confidence is equivalent to that defined by CRIRSCO for an Inferred Mineral Resource. Otherwise, the quantities should be assigned as G4 (2009). Also, note that G3 can apply to a part of a deposit that also has parts that satisfy G1 and/or G2, since the level of "exploration" may not be the same over the whole deposit.
G4	A Reconnaissance study identifies 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 and extrapolation. The objective is to identify mineralized areas worthy of further investigation towards deposit identification. Estimates of quantities should only be made if sufficient data are available and when an analogy with known deposits of similar geological character is possible, and then only within an order of magnitude.	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	No material change. Note that although the UNFC 2009 definitions are written so that they can be applied at the level of an individual deposit (even at the exploration stage, as is commonly done in the petroleum sector), they may also be applied at a regional scale to document resource potential for a geological province, for example. Such applications are discussed in the Specifications to UNFC 2009 (in preparation).