Kirill P. Kavun, C.Sc.,
Prof. Mikhail N. Denisov, D.Sc.
Institute for Economics of Mineral Resources & Use of the Subsoil, the Russian Federation.

DRAFT GUIDELINES TO THE UNFC FOR SOLID MINERALS TAILORED TO EXPLORATION AND MINING CONDITIONS OF THE CIS COUNTRIES

Why CIS?

Primarily because all post-Soviet space is the region where the need for training specialists in the issues of what the UNFC is, where and how it is to be applied is most acute and pressing:

- CIS is an essential part of the world community (more than 280 people living there), a region of great geopolitical importance;

- this is the richest treasury of energy and mineral resources which require rational management in the interests of world economy as a whole. Having formed on this basis is an authoritative multinational geological school with traditions of its own and tremendous experience accumulated in exploration and assessment of practically all kinds of mineral deposits;

- it was for a long time that this original school had been developing in isolation from advanced technical, geological and especially economic conceptions of the Western world, new approaches of economic and financial analysis, banking and stock market mechanisms and other infrastructure of up-to-date business, including rules. regulations and reporting standards. Many elements of present-day western accounting/analytical systems diverge from ours and need explanation to our specialists and public at large. For example, what is perceived with great difficulties in CIS countries, Russia included, is the classification of mineral quantities in the ground generally recognized in the West , with its "double-deck" terminology, namely "measured", "indicated" and "inferred" resources reflecting the level of geological confidence on the one hand, and "proved" and "probable" reserves on the other, as a part of resources with the highest degree of reliability of the quantities in the ground required by regulators and stock markets. If you tested ordinary geologists on the subject, 90% would answer that "measured" and "proved", "indicated" and "probable" are synonyms. That's the point.

It is partly for this reason that the need is acutely felt in the CIS for training of personnel of mining and junior exploration companies, specialists in booking and accounting in extractive industries, etc. in the application of international reporting and disclosure standards, including the UNFC, for advising them on all related problems of calculation, verification and monetary valuation of reserves and resources, for holding seminars and working groups on separate most complicated issues of trial implementation of the Framework Document now in existence. The Guidelines are regarded as an element of this integrated educational system.

The versatility of the UNFC.

The participants of this AHGE meeting are aware of the opportunities and great practical importance of the Framework Classification elaborated under the aegis of the UNECE in all principal spheres of application. What must be stressed is that the directions for the sake of which the UBFC was created should be regarded as the most important to date, that is to be an interface, a "common denominator" when making comparisons of data from various classification systems, to ensure compilation of reliable global inventories and raise efficiency of international communications in the area of use of the subsoil.

At the same time the UNFC must be a multi-purpose classification and present a structural basis for implementation of a wide range of objectives related to assessment of and monitoring the mineral raw materials base of the country. Among them of primary importance are:

♦ Resources management at the state and corporate levels in the context of a single state mineral policy, on the basis of standardized requirements for individual categories of geological and technical/economic knowledge of reserves/resources in the subsoil and the methods of their assessment;

♦ Planning of development and mining operations by subsoil users with the established legal, environment and subsoil protection, social, political/administrative restrictions and regulations strictly observed;

♦ The state statistical accounting and taking inventories of mineral resources in the form of national accounts of the nation's mineral wealth, cadastres of discovered mineral deposits and occurrences, state balances of mineral reserves and resources;

♦ Monetary valuation and capitalization of mineral assets of mining and exploration companies with the information on the state of reserves/resources and geological exploration results being filed (if necessary) with taxation authorities, banks as well as presented for public disclosure through stock markets;

♦ Reassessment of mineral resources of the CIS countries with the account taken of the market economy requirements, deficiency of supplies, strategic importance, export potential of separate kinds and individual sources of mineral raw materials, and the innovative/technological potential in mining, processing, transport and use of minerals in the people's economy;

♦ Reporting of mineral reserves/resources data to international organizations (UN, OECD, World Bank, WEF, etc.) with the aim of compiling global and regional inventories and analytical surveys determining the state, structure, specific features of distribution and the ways of further development and strengthening of the mineral raw materials base of the world economy.

To achieve these goals, the following specific features of the UNFC should be taken into consideration:

♦ - the suitability of the Classification to taking inventories and assessment of all components of the mineral potential;

♦ - the use in the booking of mineral reserves/resources of basic principles widely recognized in the world exploration practice - the levels of geological assurance and economic viability of subject quantities;

♦ - definition of reserve/resource categories by digital codes clearly locating their position along each axis of the 3D UNFC model.

Pursuant to this, the UNFC is regarded as an all-purpose classification which is capable of serving customers' needs on both state and corporate level. Depending on the goals and specificity of activities, each user might fill in or take the information from respective boxes of the matrix not paying attention to the purpose and contents of other boxes which the user is not interested in. Hereby (and naturally) the structure of the matrix in all cases remains unchanged.

A prerequisite to the application of the UNFC by diverse categories of users is the use by them of the international standards of terminology and definitions of categories and groups of reserves/resources agreed upon by the UNECE and CMMI.

Structure and contents.

The UNFC is known to our specialists only by few communications made by the participants of these meetings and some articles in magazines. In this connection we find it necessary to outline in the Guidelines in brief its history, conceptual provisions and principles of construction.

The main part of the Guidelines to the UNFC includes the description of: (1) objectives and main directions of use; (2) main features and internal structure as applied to solid minerals; (3) the method of converting reserves/resources data from national classification systems to the UNFC. Given in four annexes is the comparison of requirements imposed on categories of reserves/resources in the Russian classification and UNFC along each axis of the 3D model.

Conceptual basis.

The general sense of the term "total resources" introduced in the UNFC is disclosed in the Guidelines as well as of the concept of "reserves" and "resources" which is relatively new for CIS countries. The particular definitions of these terms are supposed to meet the requirements of financial accounting and reporting. They are dew to be refined jointly with the IASB in the context of the project on international financial reporting standards in extractive industries initiated by this organization.

Now a point for deliberation. Today the majority of professional people in our area are of the opinion that even after a certain part of "'resources" is transferred to "reserves" (with all or part of "modifying factors" taken properly into account), they nevertheless continue to remain "resources" at the same time being characterized with one or other degree of geological exploration knowledge. The whole column at the extreme left, despite being qualified as "proved" or "probable" "reserves", refers to "measured resources" as well. Not only to

its lower part as presented in the table. The whole column next to it refers to "indicated resources", not only its lower part. That is why it would make sense to put all these definitions of "resources" beyond the limits of the table where particular quantities are to be placed. This is what we're trying to do when adapting the Russian classification to the UNFC (a little further about it).

Transfer of national data on reserves/resources to the UNFC.

It seems to us that the main purpose of the Guidelines is to arm specialists from the countries concerned with the knowledge of procedures to follow and obtain the resulting reclassification. Necessary explanations in this respect are given in course of the text. The procedures consecutively fulfilled include:

♦ Identification of the geological exploration stage completed at the exploration target (mineral deposit);

♦ Assigning of explored, preliminarily assessed and speculative resources to the UNFC categories by geological assurance (axis "G");

♦ Identification of the feasibility assessment stage completed and assigning resources to the UNFC categories by degree of detail of technical/economic studies (axis "F");

♦ Allocating resource quantities to economic viability groups (axis "E");

♦ Identification of resource classes by the UNFC numerical codes;

♦ Assessment of '"proved" and "probable" reserves; geological and technical/economic justification of reserves.

A piece of criticism.

Now about one methodological and terminological inaccuracy which crept into the part of the UNFC dealing with solid minerals and may create some difficulties in the application of UNFC in CIS countries. The case in point is the names of the criterion and reserve/resource categories used on the main "geological" axis. If left unnoticed the inaccuracy in question can hamper successful implementation of the UNFC in CIS countries.

The authors of the Classification have linked the categories on axis "G" to the "***stages*** of geological assessment": "detailed exploration", "general exploration", "prospecting" and "reconnaissance". The matter of evaluation criterion was defined as "the degree of geological assurance" and this is correct beyond any doubt.

The choice of terms is quite understandable. They are construed as the actual ***state***, degree of geological exploration knowledge about a certain subsoil plot which has been achieved by exploration and is defined at the moment by particular categories. It seems correct. So what inaccuracy are we talking about? The point is that in the Russian translation these terms acquired the meaning of "stages of geological exploration", i.e. a sequence of actions, steps, consecutive ***phases*** of works implemented with more and more degree of detail. And if the notion of "degree of exploration knowledge" in the UNFC context is related to certain mineral quantities in the subsoil studied with one or other degree of detail, the "stage" in

the meaning that it was used in the Russian version of UNFC is related to the mineral deposit as a whole (or its part now

This is indeed how the names of categories along axis "G" are perceived by many users in the CIS and many other countries. And this is the reason for the judgment having spread that the criterion of geological assessment employed by the UNFC is belonging to a certain stage of geological exploration process. This judgment was favored by the description of stage character of geological exploration which was entered into the annex to the first version of the UNFC for coal and other solid minerals (1997) and which reminded to a greater extent the similar conception having long and firmly established in CIS countries.

According to the conception adopted and used everywhere in Russia and other CIS countries, the end results of geological exploration at any separate stage is normally represented by resource data of different levels of assurance, i.e. of most diverse categories, from those studied in depth and greatest detail to quantities predicted on geological premises. And this is understandable because a deposit is normally not studied simultaneously at all its plots and in full volume. In the opinion of UN experts, each stage of geological assessment produces geological information on the deposit with a clearly defined degree of geological assurance. And these two statements are not contradictory at all because we're speaking about two different things: on the one hand, about reserve/resource quantities which are studied to a certain degree of detail and geological certainty (and this is of key importance) and, on the other hand, about the amount of knowledge of the deposit, its preparedness for development and production, a sort of "maturity" of a mining project at its early stage.

Because of misunderstanding of this rather subtle difference, a discord appears in the methods of handling and allocating data from national classifications to the UNFG categories along axis "G", since it is often impossible to refer exploration results (reserves and resources) to a single stage of geological exploration, in our understanding of this term.

Ambiguous comprehension by specialists of the matter and successive procedures of allocating national reserve/resource data of different geological assurance to the categories of axis "G" is reflected in the following variants of approach to resolving this problem:

(1) by the results of exploration stage completed on a mineral deposit (prospect), allocating of **each obtained reserve/resource category** to the UNFC categories along axis "G" is carried out on the basis of evaluating its actual geological assurance and comparison with the stipulated requirements for respective categories of the UNFC

(2) assigning obtained reserve/resource categories depending upon the amount of geological knowledge about them to different stages of exploration in accordance with the rules and requirements existing in Russia (or other country) completed within a single exploration/development/evaluation cycle on one and the same deposit (prospect). Depending on distribution by exploration stage the reclassified reserves/resources are found in particular UNFC categories along axis "G";

(3) assigning of all obtained categories of reserves/resources as an integrated exploration product of a respective stage to a category on axis "G" which embodies the main task of the completed stage for a deposit (prospect) as a whole or its part under exploration.

The first approach appears to be most clear-cut and reflecting CIS exploration and mining industry realities. Once unequivocal correspondence between categories of high (A+B), reasonably high (C_1) and low geological assurance (C_2) and adequate gradations of the UNFC ("measured", "indicated" and "inferred") has been reliably confirmed, the task of accommodation of explored and estimated quantities in appropriate boxes of the framework structure actually amounts to mechanical displacement of them from one system to another.

The ambiguity of construing the matter of the criterion and individual categories on axis "G" of the UNFC would rather be eliminated. The method to tackle it is easy and doesn't require any substantial changes that could affect the integrity of the UNFC. It would only add to the internal logic of the whole system. First and foremost, both in Russian and English versions the use of the term "stage" as a classification criterion for axis "G" must be eliminated. The term has an ambiguous meaning and must be replaced. It is necessary to pass over to another generic definitions more harmonized with those used for uranium and petroleum. Most suitable seem to be the designations of different categories of resources which were touched upon earlier: "measured", "indicated" and "inferred". These names have been already used in the UNFC but, as it was stated above, in a narrow sense. Proceeding from our earlier considerations, we find it possible to use the terms in a broader more common sense and extend them to the full height of each column in the table. In this case each volume of these resources (calculation or exploitation block, subsoil plot or any prospect) could be referred directly to the degree of assigned geological assurance and be easily accommodated in appropriate UNFC boxes. In doing so, it would be easier to take into account the specific conditions and requirements of recognized categories in particular countries.

According to the CRIRSCO/JORC concept the resources in question may acquire any degree of technical/economic study. Hereby, "measured" resources are regarded as a basis for "proved" reserves and "indicated" resources for "probable" ones.

Adaptation of national classifications to the UNFC requirements.

In new conditions and business environment in CIS countries, the main directions of improvement of the reserves/resources classifications now in force are looked upon like this:

(1) Changing to 3D classification scheme by addition to the two traditional dimensions of a third one - the rank (or, in other words, the amount of detail and exactness) of technical/economic investigations fulfilled;

(2) Preserving alpha-numerical designations of categories for reserves/resources of mineral deposits and undiscovered potential units with the addition of a parallel system of international definitions agreed upon by the UNECE and CRIRSCO (with the UNFC codes to be added later) into classification matrices and instructive guidelines on their application for individual kinds of minerals;

(3) Alignment of categorization of undiscovered but predicted resources to make it coherent with the new modernized stage pattern of reconnaissance geological studies and search for mineral deposits, scales of mapping and normative requirements for the results of works on completion;

(4) Imparting to the classifications being created (as far as their economic components are concerned) of distinctly market orientation, so that:

♦ The status of reserves/resources in the subsoil be fixed as an important constituent of tangible financial assets of mining and exploration companies;

♦ Both historic exploration costs and market value-based estimates of reserves/resources be used in evaluation of mineral property and capitalization of companies;

♦ World market prices be applied when calculating cut-off limits to justify bringing mineral deposits into production;

♦ Profitability of extraction of mineral reserves for the moment of evaluation, rate of return and other economic indicators with the inherent risk levels taken into account be used as criteria of economic viability of mining investment projects, etc.

In our view, new classifications to be adopted in CIS countries harmonized with the UNFC shall take into account all kinds of explored and potential mineral resources: both conventional and non-conventional, but only those which could be a subject of calculation, scientifically based assessment and economically justified development to meet the demand.

It hardly makes sense in recognizing a separate group of "exceptional" resources with the possibilities of bringing them into production depending on government subsidies or providing any other beneficial conditions. In the opinion of our national team, this factor can't be of any material classifying meaning.

One of the proposals to be discussed in the process of development of the CIS model classification is the one of incorporating into it, in some way or the other, of some terms in English language as the language of international communication. Here meant are the terms which have acquired today the significance of international standards. They seem to be most suitable as additional designations of the basic categories and groups of reserves and resources. The step like this could strengthen the international implications of the CIS classification systems and become a factor facilitating business communications in the mineral and energy sectors of the world economy.

Presented on the slide is the draft model classification for the CIS states. To be mentioned first should be that it is based on the classical "McKelvey box" with the geological assurance of reserve/resource estimates depicted by categories along the horizontal axis and the level of current economic efficiency on the vertical one. Despite the use of this well known template we call this model "innovative" for the following reasons:

(1) The version may be regarded as being coherent to the most important for today international standards of classification, reporting, terminology and definitions: CRIRSCO/JORC and UNFC. Owing to this, the CIS model classification and the standards stated above are compatible with reasonable facility. Both are intended and can be used in corporate planning, in bankable feasibility studies and in stock exchange practices together with other documentation of the companies going through listing procedures at diverse trading points of

the world. They can also serve as a basis when carrying out audits of reserves/resources by both domestic and foreign consulting and engineering companies.

The following terms are going to be used in the model classification to characterize the degree of exploration knowledge and the level of geological confidence: "measured" as corresponding to the Russian categories A+B; "indicated" that can be normally put in compliance with the Russian C_1 resources; "inferred" (corresponding to the category C_2).

Recognized in the model classification by the degree of detail of feasibility assessment are the standard Western style definitions of "feasibility study", "prefeasibility study" and "initial geological/economic study". The initial geological/economic study (or "opportunities study") is carried out at the early phase of project implementation. Prefeasibility studies in CIS completed on the deposit are represented by a "technical/economic report and justification of preliminary cut-off values", conclusive feasibility studies are adequate to the "technical/economic justification of permanent cut-off values".

(2) As in the UNFC, the distinction is made between: a) resources which by actual results of feasibility or prefeasibility assessment have been qualified as "economic"; b) resources which by the results of the same assessment have been found unprofitable for recovery, i.e. "subeconomic"; c) resources assessed by geological data which have not been yet subjected to feasibility assessment with such amount of detail and by virtue of this remain in the categories of "measured" and "indicated" resources with respective degree of geological exploration knowledge assigned.

(3) A group of "marginal resources" is recommended to be recognized within those referred to as "subeconomic". These are resources which are considered to be on the verge of being "economic", profitable for exploitation and characterized by a high probability to be brought in commercial operation in the near future. This approach to the specified portions of subeconomic resources is characteristic of the evaluation practice of a number of advanced mining countries, primarily of the North American continent.

(4) As previously, in all CIS countries (former republics of the USSR) undiscovered (predicted) resources shall be included in the range of mineral quantities subject to classification and taking inventory. A common view is that if these resources are not taken into account the assessment of mineral potential of the country or a region wouldn't be full. Of special importance is the role assigned to predicted resources in determination of directions of further geological exploration, strategic planning and justification of the state long-term mineral policy. In the CIS model classification for solid minerals, the group of undiscovered resources is subdivided into three categories differing in the nature and dimensions of assessment targets, methods of identifying areas of enhanced mineral potential and the degree of reliability of the results. Three categories of undiscovered resources are recommended to be recognized: P_1 - in known deposits and ore occurrences; P_2 - in known ore fields, knots, regions and basins, identified by results of prospecting and mapping at the scales of 1:50,000 - 1:10,000; and P_3 established on the basis of broad geological knowledge, by geological evidences, geophysical and geochemical data without any reference to pariular object.

(5) A number of novelties has been included in the draft model version to suit more distinctly new demands of market economy and the ongoing globalization of the mining capital and business. As in the other, analogous by purpose classifications of the leading mining nations represented in the CMMI, rather high attention is paid to the factors determining commerciality of reserves/resources, their capacity to ensure (in case of development and production) the necessary rate of return on invested capital. Hence, the particular emphasis placed on the requirements that allow to classify a certain part of estimated resources as "reserves".

The classes of "proved" and "probable" "reserves" are going to be reflected on the scheme in a specific manner. "Reserves" figures are to be entered into color-marked rectangles placed inside the boxes corresponding to "measured" and "indicated" resources, the latter being the basis on which they are calculated and justified. Once a certain portion of resources belonging to the stated "source" units has been requalified to "reserves", the data on remaining resources which (for one or other reason) have not been transferred to "reserves" are quoted in respective "source" boxes.

(6) The concept of "Competent Person" (in its full meaning according to both CRIRSCO and UNFC) is a completely new for reserves/resources management in Russia and other CIS countries. From what is suggested in this connection, of key importance are the formation of specialized institution of expert evaluators, the appropriate professional association and introduction of the juridical norm targeted at the establishment of personal and corporate responsibility for filing by experts of erroneous or deliberately forged information on reserves/resources having undergone feasibility assessment stage.

The proposed model classification of reserves/resources for solid minerals intended to be recommended for the CIS and other interested countries is based on a number of principal positions which determine its similarity to and compatibility with the international UN Framework Classification. In the graphical display it can be presented as both two- and three-dimensional model with its boxes identified by means of the UNFC three-digit numerical codes clearly identifying the location of classified quantities along each Classification axis.

RUSSIAN CLASSIFICATION OF MINERAL RESOURCES.

Presently in place

Increasing degree of geological assurance →

Economic Viability Groups	Reserves/resources of explored and preliminarily assessed deposits			
	A	**B**	**C$_1$**	**C$_2$**
Economic				
Subeconomic				

Recommended as a template for CIS countries (model classification)

Feasibility Assessment Stages	Economic Viability Groups	Reserves/resources of explored and preliminarily assessed deposits			
		A	**B**	**C$_1$**	**C$_2$**
		Measured Resources		Indicated Resources	Inferred Resources
Feasibility Study or Mining Report	Economic	PD			
	Subeconomic				
Prefeasibility Study	Intrinsically Economic	PB		PB	
Initial Geological/ Economic Study	Undetermined Economic Viability (operative booking)				

▨ - Marginal Resources

PD - Proved Reserves   PB - Probable Reserves

10