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PRACTICAL APPLICATION OF THE UNITED NATIONS FRAMEWORK
CLASSIFICATION FOR RESERVES/RESOURCES IN CHINA

(Submitted by the Government of China)

1. Introduction

The main purposes of this paper are to present (1) the contents and characteristics of the newly developed, by the Chinese Government, mineral resources/reserves classification system which is based on the UN-Framework Classification for Reserves / Resources: Solid Fuels and Mineral Commodities (UNFC); (2) the efforts and progress that the Chinese Government has made to date, in popularizing the application of the system to energy and mineral sectors; and (3) the difficulties the Chinese Government is facing with a few issues that remain to be resolved.

The Chinese Government introduced the new edition of *Classification for Resources/Reserves of Solid Fuels and Mineral Commodities* as a national standard in June 1999, which represents a revolutionary reform in the mining industry of China. The previous technical classification system was very similar to that of the former Soviet Union. The mineral occurrences were divided into two major categories, i.e. mineral reserves and resources, of which only mineral reserves were considered in terms of economic and technical circumstances.

On the other hand, within the above two major groups, the mineral reserves were subdivided in priority order of geological confidence into A, B, C, D and E sub-categories. The above edition, which was different from the international well known normal practices, had made it very difficult for mining industry of China to communicate in common language with that of other countries, and hence, it has impeded the progress of China in developing market economy and opening its door to the world for investments in the mining industry.

Since 1995, the Chinese Government has nominated experts to the UN Task Force and it has been continually engaged in the development and implementation of UNFC. The Chinese Ministry of Land and Resources maintains close contacts with the UN/ECE and with the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP) regarding further activities related to the implementation of the Classification.

In its efforts, the Chinese Government has been attempting to establish a national classification system for mineral resources/reserves which could be both acceptable to the local circumstances and compatible/comparable with international normal practice. The several years of efforts ultimately resulted in a new classification system, which is in line with the market-oriented principles vis-à-vis the definitions and implications of the terminology, and it is compatible with the UNFC. It also offers the opportunity for Chinese companies to develop mining operations abroad.

2. The new Chinese classification system

The new edition of *Classification for Resources/Reserves of Solid Fuels and Mineral Commodities (National Standards/T17766-1999)* entered into force on 1 December 1999. It will be used as a basis for mineral resources exploration and development, estimation and registration of reserves/resources, geostatistics, and guidelines for policy making and planning. The advantages of the new classification system can be defined as follows:

- The new classification system can be successfully applicable to all metals, minerals, coal and uranium;
- The new Chinese classification system adopts the three-dimensional classification model as recommended by UNFC. Mineral occurrences are sub-divided into sixteen categories within three major categories, i.e. reserves (three sub-categories), basic reserves (six sub-categories) and resources (seven sub-categories).
- The categories of mineral occurrences in question are demonstrated through a three-dimensional coding tool, i.e. E represents the degree of Economic Viability, F represents the stage of Feasibility Assessment and G represents the degree of Geological Assurance.
- The degrees of Geological Assurance (axis), based on the result of exploration, are subdivided into measured, indicated, inferred and reconnaissance parts. The stages of mineral exploration work are subdivided into detailed exploration, general exploration, prospecting and reconnaissance parts;
The stages of the Feasibility Assessment (axis) are subdivided into feasibility study, pre-feasibility study and geological study parts, depending on the level of assessment work;
The degrees of Economic Viability (axis) are subdivided into economic, marginal economic and sub-economic categories. These three categories are related only to the mineral occurrences at the stages of feasibility and pre-feasibility study. As with the mineral occurrences at the stage of geological study, the degree of economic viability lying somewhere between economic and sub-economic categories, is defined as "intrinsic economic".

**Chinese Classification for Reserves/Resources
-Solid Fuels and Mineral Resources-**

China System	Total Identified Mineral Resources			Undiscovered Resources
	Measured	Indicated	Inferred	Reconnaissance
Economic	Proved Extractable Reserve (111)	Possibly Proven Reserve?		
	Basic Reserve (111b)			
	Probable Extractable Reserve (121)	Probable Extractable Reserve (122)		
	Basic Reserve (121b)	Basic Reserve (122b)		
Marginal Economic	Basic Reserve (2M11)			
	Basic Reserve (2M21)	Basic Reserve (2M22)		
Submarginal Economic	Resource (2S11)			
	Resource (2S21)	Resource (2S22)		
Intrinsic Economic	Resource (331)	Resource (332)	Resource (333)?	Resource (334)?

Note: the code (111-334), the first number as the degree of economic viability: 1=economic, 2M= marginal economic, 2S= submarginal economic, 3= intrinsic economic, ?=undetermined. the second number as the stage of feasibility assessment: 1= feasibility study, 2= pre-feasibility study, 3=geological study. the third number as the geological assurance: 1=measured, 2=indicated, 3=inferred, 4= Reconnaissance. b=in situ.

Proven Reserve

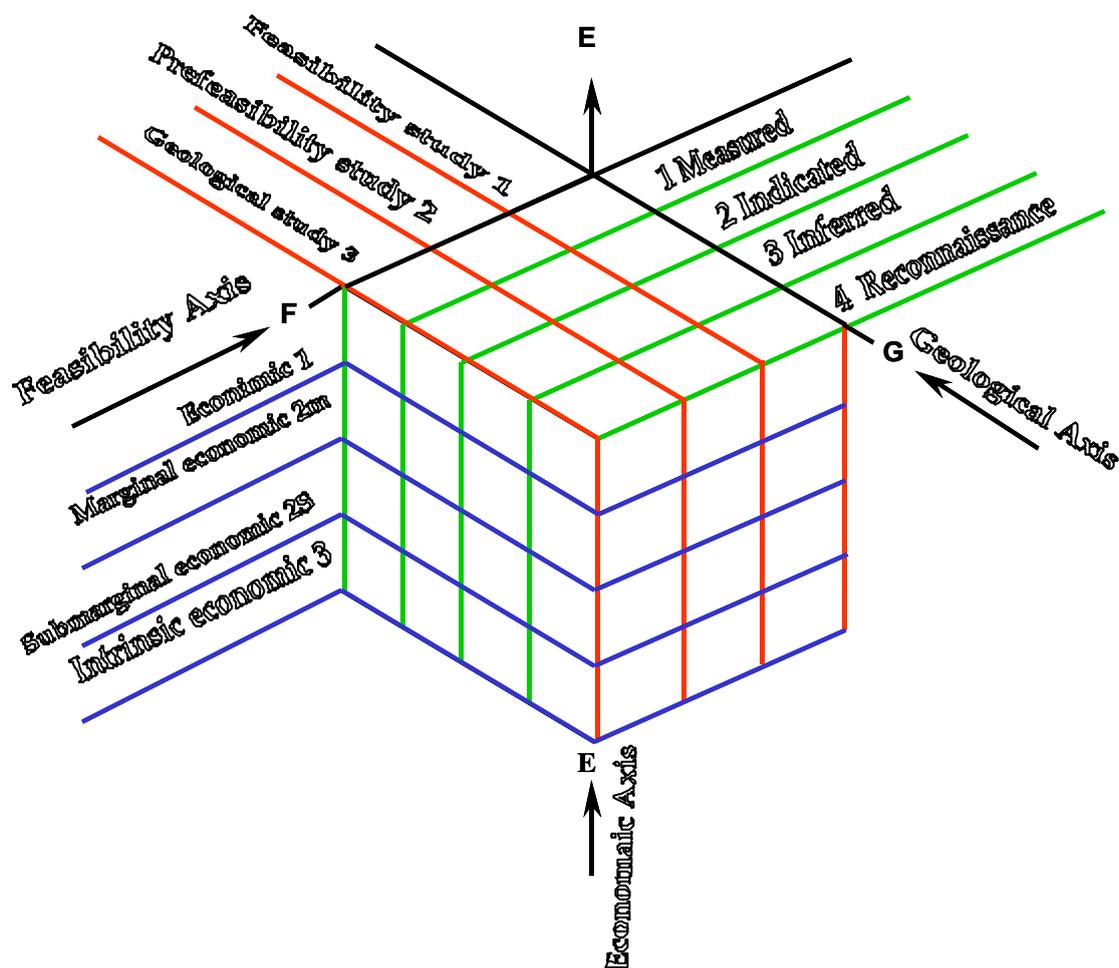
Probable Reserve

Measured Mineral Resource

Indicated Mineral Resource

Inferred Mineral Resource

Take care in assessing data point spacing

Figure 1

3. Compatibility of the Chinese System with UNFC

The Chinese system is adapted to UNFC principles because it:

- Adopts a three-dimensional classification model, including degrees of geological assurance, stages of feasibility assessment and degrees of Economic Viability;
- The degrees of geological assurance are subdivided into four parts, stages of feasibility assessment are subdivided into three parts and degrees of Economic Viability three parts;
- It takes the result of feasibility studies as an important basis on which to judge whether or not the mineral occurrences are economic viable. Economic viability of various categories is highlighted;

In order to facilitate popularizing the new system throughout industry in China, the new system gives enough consideration to the conventions that industry in China has been used to, though conforming with UNFC concerning in terms of definitions of the main terms.

The minor differences can be described as follows:

Not every stage of exploration work corresponds to only one degree of geological assurance, and *vice versa*. For instance, mineral occurrences at the stage of detailed exploration can not only derive measured category, but also the indicated category partly; According to the term "Reserve Base", the category of basic reserve is supplemented and the concept of "intrinsic economic" is introduced. The purpose of introducing the above two wordings is to demonstrate the sort of undeveloped mineral occurrences to date for which exploration work has been done during the period of centrally planned economy but a special feasibility study is unworthy or impossible to do so;

It is consistent with that of CMMI in which a reserve is the economically extractable part of a mineral occurrence, while a base reserve refers to an in-situ mineral occurrence, therefore both government and entities can use the classification system;

- Does not adopt the category of "additional" because it has been included in the category of "economic" in the Chinese system.

Comparison of the Chinese system and UNFC

UN Framework		China System
Mineral Reserves	Proved Mineral Reserve (111)	Mineable reserves (111) basic reserves (111b)
	Probable Mineral Reserve (121)	Probable extractable reserves 121 base reserves 121b
	Probable Mineral Reserve (122)	Probable extractable reserves 122 basic reserves 122b
Remaining Mineral Resources	Feasibility Mineral Resource (211)	Basic reserves 2M11 resources 2S11
	Pre-feasibility Mineral Resource (221)	Basic reserves 2M21 resources 2S21
	Pre-feasibility Mineral Resource (222)	Basic reserves 2M22 resources 2S22
	Measured Mineral Resource (331)	Resources 331
	Indicated Mineral Resource (332)	Resources 332
	Inferred Mineral Resource (333)	Resources 333
	Reconnaissance Mineral Resource (334)	Resources 334

4. Application of the Classification System in China

The Chinese government has made great efforts to popularize the application of the new system throughout industry since it was promulgated more than a year ago. In this respect, it launched a plan of action emphasizing the following aspects:

- **Training Programme**

In order to promote the practical implementation of the new system, the Chinese Government has made great efforts to make it widely known to industry and pursued a training programme around the country. A number of experts, including government administrators at varying levels, mineral resources evaluators, geologist and mining experts from the state-owned exploration and/or mining entities, professional organizations, etc. have taken part in the multi-level training. Such a training programme will be extended on a national level.

- **Updating of the Exploration Code**

In order to respond properly to the requirements of the new classification system, the present mineral exploration code had to be revised, so as to make possible an objective re-assessment of mineral resources/reserves inventories in China under market conditions. The previous 45 existing exploration codes for special mineral commodities, including coal, copper, iron ore, lead, zinc and others have been resumed into twenty codes. The revision of the twenty codes, sponsored by the government and drafted by various related sectors was approved recently.

- **Transformation of the national mineral resources/reserves inventories depending on the new system**

In order to facilitate the national statistics depending on the new standard, the Chinese Government has decided to reclassify all the native annual statistical data for solid minerals. This effort is organized by the government agency, with all the related holders of mineral rights involved by submitting basic information. The Government has set up uniform technical standards and requirements on which some specialists are carrying out the programme.

To date, the reclassification of twenty thousand mineral properties, related to forty-five main minerals commodities, has already been completed. The result shows that the percentage of respective resources and reserves categories in mineral occurrences has altered greatly, with economical viability being highlighted. The information gained about the resources and reserves, which have been reclassified based on the new system, can make it easy for users to compare with the international well known categories, and hence acts as a basis on which entities are able to make investment decisions. Reclassification of other mineral commodities and the revisions of related technological standards will be completed in the year 2001. Up to 2002, the Chinese Government will re-assess the mineral resources/reserves and carry out mineral commodity statistics based on the new system and related technological standards.

5. Revision of the classification standards for oil and gas

The current code for oil and gas classification was adopted in 1988. Then, there were a few proposals, since its promulgation, to revise it. Fortunately, the newly-developed *Classification for Resources/Reserves of Solid Fuels and Mineral Commodities* came out in a timely way and it acted as a catalytic promoter to revise the code for oil and gas classification. The revision work, using the definitions and classification criteria adopted by WPC and SPE for reference, has been almost completed up to date. The code could be summarized by the following features:

- The Stages of exploration are sub-divided into regional exploration, pre-exploration and evaluation exploration parts;
- The Degrees of economic viability are sub-divided into economic, sub-economic and intrinsic economic categories;
- Classify respectively at levels of geological resources, geological reserves and extractable reserves.

Geological resources are classified according to varying stages of exploration. Geological reserves are classified depending on both stages of exploration that the whole deposit is at and levels of geological confidence. Extractable reserves are classified depending on both levels of confidence with regard to the each part of the oil and gas deposits and application degrees of the technology by which the recovery is raised.

6. Conclusions

The Ministry of National Land and Resources has greatly contributed to the development of the new classification code. The Chinese government has closely followed and supported the popularization and application of the new system. The Chinese mining and other relevant industries extensively agree to and praise it, which results in the effective enforcement and strong influences on the community, and brings about the good outcomes. The new classification is very useful for foreign investment in mineral exploration to develop Chinese resources, and particularly promotes the Development of West China Strategy launched by the Chinese government. Without doubt, however, it challenges Chinese traditional ideas after all, so the task to popularize and employ it is very hard with a lot of difficulties and problems.

7. Need for further understanding of the UNFC

Due to lack of experience and information about how other countries have proceeded with their reserves/resources estimation when applying the UNFC it was and still is very difficult in China to reach agreement in dealing with technical problems when transforming previous resources/reserves categories into new ones and revising technological standards.

Therefore, we are still facing serious difficulties in implementing the new system nation-wide and providing training with financial resources to the users at various levels in a short time. For information, the potential users come from more than 200,000 mining entities, one thousand state owned exploration entities and various levels of government agencies.

It should be recognized that there is still much to be done to implement the new system widely into practice. The Chinese government is determined firmly to achieve it while professional experts to continue actively to pay attention to it and cooperate at international level, with a view to acquiring more experience for the benefit of UNFC application in China.

Our proposals for international cooperation in the area of improving and popularizing the new classification system can be summed up as follows:

- We propose that the related UN organizations, both regional commissions and specialized agencies, consider the possibilities for providing an international training programme. We also hope that we are allowed to participate in the practical work of the countries which have been engaged in the drafting of international classification standards. In addition, a communication with industry of other countries and participation in field studies of some typical mining area are to be encouraged;
- We suggest that advisory assistance through UN Task Force and UN-ESCAP should be provided to all countries are being prepared to implement the UNFC to their energy and mineral sectors;
- We suggest establishing, through UN assistance, a long term cooperative programme, with other countries, especially within the region, to improve the regional and worldwide development.