



National Standard of the People's Republic of China

GB/T 17766—1999

# Classification for resources/reserves of solid fuels and mineral commodities

## 固体矿产资源/储量分类

(English Translation)

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## Foreword

SAC/TC 93 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

For the purpose of bringing Chinese Standard for classification of solid fuels and mineral resources / reserves, which has been in operation for many years, into line with the internationally recognized classification standards so as to facilitate international exchanges and in accordance with the relevant classification provisions of National Standard of GB 13908—1992 *General requirements for solid minerals exploration*, mainly referenced to the *United Nations International Framework Classification* for reserves/resources (U.N. Economic and Social Commission ENERGY / WP.1 / R.70 Document) and the *Principles of a resource/reserve classification for minerals (1980)* produced by the U.S. Bureau of Mines and the U.S. Geological Survey, while taking into consideration China's national conditions to formulate this standard.

Upon this standard release, any formulation of or amendments to this standard, codes and guides for solid fuels and minerals or any parts with connection to classification of solid fuels and mineral resources/reserves must comply with this standard. In case of any inconsistencies between this standard and other standards or codes, this standard shall prevail.

Annex A, B and C are informative annexes to this standard.

This standard is proposed and prepared by the Ministry of Land and Resources.

This standard is to be interpreted by the Department of Reserves of the Ministry of Land and Resources.

# Classification for resources/reserves of solid fuels and mineral commodities

## 1 Scope

This standard specifies the scope of application, definitions, classification, categories and codification of the national classification of resources / reserves for solid fuels and mineral resources.

This standard is applicable to design, deployment, reserves (resources) calculation and report writing for each stage of exploration and development of solid fuels and mineral resources. It is not only applicable to the evaluation of resources/reserves of solid fuels and mineral resources, registration, statistics, scheduling, planning, formulation of policies on Solid Fuels and Mineral Commodities, and the development of mineral exploration codes, rules and guides, but can also serve as the basis for evaluation and calculation of resources/reserves of solid fuels and mineral resources for the purpose of mineral rights transfers and financing for mineral exploration and development.

## 2 Definitions

For the purposes of this document, the following definitions apply.

**2.1 solid fuels and mineral resources:** Concentrations of naturally occurring solid material in or on the earth's crust which is of economic interest and in such an output form, quantity and quality that eventual extraction can be expected to be technically and economically feasible. Their locations, quantities, grades/qualities and geological features are calculated or estimated on specific geological grounds and knowledge. Based on geological assurance, they can be divided into total identified mineral resources and undiscovered resources

**2.1.1 total identified mineral resources:** The total solid fuels and mineral resources that have been discovered through exploration. Based on their geological assurance and various outcomes of feasibility assessments, they can be divided into the following three subcategories: extractable reserve, basic reserve and resource

**2.1.2 undiscovered resources:** The Unproved solid fuels and mineral resources that have been predicted on geological evidence and on geophysical and geochemical anomalies.

2.2 mineral exploration<sup>1)</sup> is divided into four stages: reconnaissance, prospecting, general exploration, and detailed exploration.

2.2.1 reconnaissance: A stage in which an area with greater potential for mineralization and prospecting is predicted or proposed, based on regional geology and/or the outcomes of studies on geophysical and geochemical anomalies, preliminary field inspections, the outcomes of a very small number of sampling tests, and the comparison with known deposits with similar geological features. Reconnaissance resource may be estimated when there are sufficient grounds, which fall into the category of Undiscovered resources.

2.2.2 prospecting: A stage in which outcrop inspections, geological mapping, a limited number of sampling explorations, and geophysical and geochemical exploration are conducted for an area with greater potential for mineralization and prospecting or with geophysical and geochemical anomalies to roughly establish the general features of geology and structure of the area for prospecting and to have a general knowledge of the shape, occurrence and quality features of the ore body (seam). The hydrological, geotechnical and environmental conditions for the mining for the deposits, and an analogy on the processing and metallurgical performance of minerals has been conducted. Eventually a proposal must be made on whether it is worthwhile to conduct any further general exploration or to delineate the scope of general exploration.

2.2.3 general exploration: A stage in which large-scale geological mapping and a variety of exploration methods and means are utilized for the general exploration area that has been delineated in the prospecting process. Compared with the prospecting stage, denser and systematic samplings are undertaken to primarily establish the basic geology, structure, the main ore body's shape, occurrence, size, ore quality, the continuity of the ore body, and the hydrological, geotechnical and environmental conditions for the mining of the deposits. Analogies or laboratory flow process tests and studies on the processing and metallurgical performance of ores are conducted to evaluate whether they have any commercial value. The scope of exploration area is defined and can be used for prefeasibility study, general mine planning and the preparation of mine project proposals if required. For mining areas that are directly available for development and exploitation, the level of processing and metallurgical performance tests must be such as to meet the requirement for mine development and design.

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1) In the United Nations Framework Classification for Reserves/Resources, Geological Studies are divided into the following four stages: Detailed Exploration, General Exploration, Prospecting, and Reconnaissance. A comparison of their definitions shows that the first three stages are equivalent to the detailed exploration, general exploration and prospecting in China, respectively. However, the Reconnaissance stage is not listed as a mineral exploration stage in China. A comparison shows that this is a stage before Prospecting, which is designed to provide the grounds for Prospecting. This stage is called "pre-prospecting" in Chinese based on the custom, which is equivalent to the "Reconnaissance" stage in the United Nations Framework Classification.

**2.2.4 detailed exploration:** A stage in which a variety of infill sampling explorations - are conducted for known deposits with commercial value or for detailed exploration areas that have been delineated through general exploration, at the spacing of sampling that is sufficient to confirm the continuity of the ore body (seam), to establish in detail the geological features of the deposits, the ore body's shape, occurrence, size, spatial location, ore quality features, and the hydrological, geotechnical and environmental conditions. Laboratory processing tests or laboratory continuous pilot tests are conducted on the processing and metallurgical performance of ores. If required, pilot plant tests are conducted to provide grounds for a feasibility study or mine development and design.

**2.3 geological assurance** <sup>2)</sup> reflect various degrees of accuracy of the results obtained from the mineral exploration stages, which are divided into the following four categories: measured, indicated, inferred and reconnaissance.

**2.3.1 reconnaissance:** This refers to the results obtained after reconnaissance is conducted for an area with greater potential for mineralization and prospecting. reconnaissance resources can only be estimated when there is sufficient data and an analogy can be made with a known deposit of similar geological features.

**2.3.2 inferred:** This indicates that the geological features of minerals and the distribution, grade, quality of the ore body (site) have been roughly established for the prospecting areas as per the accuracy requirement for prospecting, as well as the parts extrapolated from basic reserve or resource with relatively high geological assurance. However, due to limited information and a number of uncertainties, the continuity of ore body (site) is inferred. The estimation of resources is based on limited data, with a relatively low level of confidence.

**2.3.3 indicated:** This indicates that the main geological features of the deposit, the ore body's shape, occurrence, size, ore quality, grade, the hydrological, geotechnical and environmental conditions for the mining, and the continuity of the ore body have been primarily established within a certain range in the exploration area, as per the accuracy requirement of general exploration. The estimation of quantities of solid fuels and mineral resources is based on more data, with a relatively high level of confidence.

**2.3.4 measured:** This indicates that the geological features of the deposits, the ore body's shape, occurrence, size, ore quality, grade, the hydrological, geotechnical and environmental conditions for the mining, and the continuity of the ore body have been established in detail within the detailed exploration range in the exploration area as per the accuracy requirement of detailed exploration. The estimation of quantities of solid fuels and mineral resources is based on a comprehensive range of data, with a high level of confidence.

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2) Geological assurance is divided into four categories that measured, indicated, inferred and reconnaissance which are equivalent to Measured, Indicated, Inferred and Reconnaissance in the 1997 United Nations Framework Classification.

2.4 feasibility assessment is divided into the following three stages: geological study, prefeasibility study and feasibility study.

2.4.1 geological study: This is a brief assessment of the economic viability for the development of deposits, using the indexes of ore grade, thickness and depth of ore body, etc., which are usually the empirical data collected by national mine sites over the last few decades. The estimation of mining cost is based on similar mining operations. Its objective is to determine whether there is an investment opportunity. Due to the lack of accurate parameters and detailed information required for assessment, the estimated resources in a scoping study only have intrinsic economic viability.

2.4.2 prefeasibility study: This is a preliminary assessment of the economic viability of the extraction of deposits. Its outcomes may form the basis for decisions on whether to conduct detailed exploration or feasibility studies for the particular deposits. This type of study usually requires the resources/reserves of solid fuels and mineral resources to be calculated by means of referring to industrial index after general exploration or detailed exploration, processing and metallurgical test information of laboratory scale, and estimated costs based on price lists and comparable mining operations. A prefeasibility study is similar to a feasibility study in the items it is required to address (see Annex C), but is not as detailed. Investors should choose the current market price indexes and various parameters and make sure it includes a comprehensive list of items when they conduct prefeasibility studies for their proposed projects.

2.4.3 feasibility study: This is a detailed assessment of the economic viability of a deposit. Its outcomes may form the basis for detailed assessment of the technical and economic viability and for investment decisions. It utilizes highly accurate cost data, and is often based on the resource figures obtained from detailed exploration and the results of corresponding processing and metallurgical performance tests. The study is very current because the cost and equipment quotations and other parameters required are based on current market prices, while taking into full consideration of geological, engineering, environmental and legal information, and government policies on the economy as well as a number of other factors. See Annex C for the items that need to be addressed in a feasibility study.

2.5 degree of economic viability: Based on the assessment of current economic feasibility through various stages of feasibility assessment, the identified mineral resources with various geological assurance can be divided into the following subcategories: economic, marginal economic, submarginal economic, and intrinsic economic.

2.5.1 economic: The quantity and quality of resources/reserves of solid fuels and mineral resources are calculated with production indexes that are established based on market prices. It is demonstrated by means of a feasibility study or a prefeasibility study that extraction under current market conditions is technically and economically feasible. Permitted by environmental conditions and other conditions, the average value of commodities extracted each year must be sufficient to satisfy the required return on investment. Alternatively, their exploitation is made possible through government subsidies and/or other supportive measures.

**2.5.2 marginal economic:** It is demonstrated by means of a feasibility study or a prefeasibility study that extraction at the time is not economic, but borders on being so. It might become economic as a result of improved technical, economic, environmental and other conditions or through other supportive measures of governments in the future.

**2.5.3 submarginal economic:** It is demonstrated by means of a feasibility study or a prefeasibility study that extraction at the time is not economic or is not technically feasible, and would require substantially higher commodity prices or a major cost-reducing advance in technology before it becomes economic.

**2.5.4 intrinsic economic:** Assessment of relevant investment opportunities has been made by means of a geological study only. No prefeasibility study or feasibility study has been conducted. Due to a number of uncertainties, it is impossible to decide whether it is economic, marginal economic or submarginal economic.

**economic-interest undefined:** This only refers to reconnaissance resources that have been estimated after a reconnaissance has been done. It falls into the category of undiscovered resources whose economic viability cannot be defined.

See Annex A for the list of defined terms in a Chinese-English glossary.

### 3 Classification and codification

**3.1 Basis of classification:** The main basis of the classification for resources / reserves of solid fuels and mineral resources consists of various geological assurance obtained through mineral exploration as well as various degrees of economic viability obtained from corresponding feasibility assessments which are shown in a three-dimensional format (Figure 1). On this basis, solid fuels and mineral resources/reserves are divided into three categories of extractable reserve<sup>3)</sup>, basic reserve and resource and are further subdivided into 16 subcategories, which are shown in a matrix format (Table 1).

**3.2 Classification (See Figure 1, Table 1 and Annex B):**

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3) In the United Nations Framework Classification for Reserves/Resources, the Mineral Resources are divided into two categories, Reserves and Mineral Resources. In the United States of America, Mineral Resources are divided into three categories, Reserves, Reserves Base and Resources. China's reserves are comparable to those in the United Nations and the United States of America. China's basic reserve is included in the Mineral Resources of the United Nations and Reserves Base of the United States of America (please refer to Annex B).

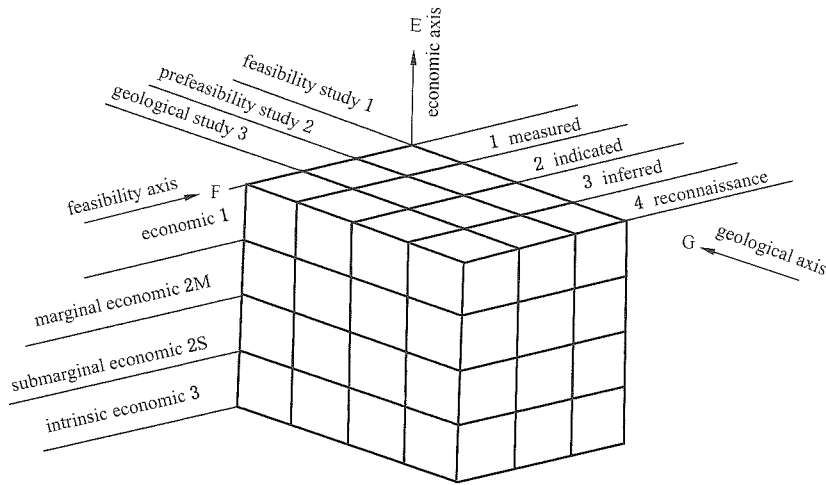


Figure 1—Framework classification for resources/reserves of solid fuels and mineral resources

3.2.1 extractable reserve: This refers to the economically extractable part of the basic reserves. At the time of the prefeasibility study, feasibility study or the formulation of an annual extraction plan, studies on the economic, mining, processing, metallurgical, environment, laws, market, society, government and other factors and relevant modifications have been carried out to demonstrate that this part is economic and extractable or has already been extracted at that time. Extractable reserves are stated in terms of actual extractable volume less design and mining losses and based on the various stages of feasibility assessment, extractable reserve can be divided into proved extractable reserve and probable extractable reserve.

3.2.2 basic reserve: This refers to the part of total identified mineral resources which is able to meet the requirements of the indexes for current mining and production (including grade, quality, thickness, hydrological, geotechnical and environmental conditions for the mining, etc). It is the part of an indicated or measured resource as demonstrated by general exploration or detailed exploration and is considered to be economic or marginally economic by means of a feasibility study or prefeasibility study, stated in terms of a volume without deducting design and mining losses.

3.2.3 resource: This refers to a part of total identified mineral resources and undiscovered resources which not only includes submarginal economic resource that has been demonstrated by means of a feasibility study or prefeasibility study, but also includes intrinsic economic resource that has been demonstrated by exploration without a feasibility study or a prefeasibility study, as well as reconnaissance resource that has been demonstrated by reconnaissance.

Table 1—Classification for resources/reserves of solid fuels and mineral resources

classification category	geological assurance	total identified mineral resources			undiscovered resources
		measured	indicated	inferred	reconnaissance
degrees of economic viability					
economic		proved extractable reserve (111)			
		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)?
<p><b>NOTE</b> Codes used in Table (111—334)</p> <p>The 1<sup>st</sup> digit refers to degrees of economic viability; 1 = economic; 2M = marginal economic; 2S = submarginal economic; 3 = intrinsic economic; ? = economic-interest undefined.</p> <p>The 2<sup>nd</sup> digit refers to level of feasibility assessment; 1 = feasibility study; 2 = prefeasibility study; 3 = geological study.</p> <p>The 3<sup>rd</sup> digit refers to geological assurance; 1 = measured; 2 = indicated; 3 = inferred; 4 = reconnaissance.</p> <p>b = extractable reserve without deducting any design or mining losses.</p>					

3.3 Codification: A three-dimensional EFG codification has been employed, with E, F, G representing economic axis, feasibility axis and geological axis, respectively (See Figure 1).

The first digit of the code refers to degree of economic viability; 1 = economic; 2M = marginal economic; 2S = submarginal economic; 3 = intrinsic economic. The second digit refers to level of feasibility assessment; 1 = feasibility study; 2 = prefeasibility study; 3 = geological study. The third digit refers to geological assurance; 1 = measured; 2 = indicated; 3 = inferred; 4 = reconnaissance. An English letter “b” is added to the end of the code to refer to the basic reserve, part of which can be converted into extractable reserve, so as to differentiate it from extractable reserve.

3.4 Categorization and codification: Based on geological assurance and economic viability, extract-

able reserve, basic reserve and resource can be further divided into 16 subcategories (See Table 1).

3.4.1 extractable reserve: consists of 3 subcategories.

3.4.1.1 proved extractable reserve (111): This refers to the extractable part of measured economic basic reserve for which the detailed three-dimensional delineation of the ore body has been established at the locations where infill exploration programs has been conducted as per the requirements of the detailed exploration stage, which has confirmed the continuity of the ore body, and has identified in detail of the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining and the results obtained from relevant ore processing and metallurgical tests, the feasibility study that has already been conducted, including the studies on mining, processing and metallurgical, economy, market, laws, social and government factors and any relevant changes, have demonstrated that the extraction is economic at the time of calculation. The level of confidence is high in the extractable reserves that have been calculated and in the results of a feasibility assessment.

3.4.1.2 probable extractable reserve (121): This refers to the extractable part of measured economic basic reserves for which the detailed three-dimensional delineation of the ore body has been established at the locations where infill exploration programs has been conducted in the detailed exploration stage, which has confirmed the continuity of the ore body, and has identified in detail of the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining. The results obtained from relevant ore processing and metallurgical tests have demonstrated that the extraction is economic at the time, but only the prefeasibility study has been conducted. The level of confidence is high in the extractable reserves that have been calculated, but moderate in the results of the feasibility assessment.

3.4.1.3 probable extractable reserve (122): This refers to the extractable part of indicated economic basic reserve for which the preliminary three-dimensional delineation of the ore body has been primarily established at the locations that have met the work requirements in the general exploration stage, and is able to identify the locations with continuity of the ore body with a certain level of confidence, and has basically identified the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining with the result of conditional test on ore processing and metallurgy. The test results of comparable mineral tests may also be utilized for free-milling ores with mature process of mineral processing. The results of a prefeasibility study have demonstrated the extraction to be economic. The level of confidence is reasonable in the extractable reserves that have been calculated, but moderate in the results of the feasibility assessment.

3.4.2 basic reserve: consists of 6 subcategories.

3.4.2.1 measured (feasibility study) economic basic reserve (111b): It is similar to what is stated in 3.4.1.1 in terms of the exploration stage it has reached, the geological assurance, the level of feasibility assessment and the classification of economic viability. But this subcategory is stated in

terms of a volume without deducting design and mining losses, which is the only difference.

**3.4.2.2** measured (prefeasibility study) economic basic reserve (121b): It is similar to what is stated in 3.4.1.2 in terms of the exploration stage it has reached, the geological assurance, the stage of feasibility assessment and the classification of economic viability. But this subcategory is stated in terms of a volume without deducting design and mining losses, which is the only difference.

**3.4.2.3** indicated economic basic reserve (122b): It is similar to what is stated in 3.4.1.3 in terms of the exploration stage it has reached, the geological assurance, the level of feasibility assessment and the classification of economic viability. But this subcategory is stated in terms of a volume without deducting design and mining losses, which is the only difference.

**3.4.2.4** measured (feasibility study) marginal economic basic reserve (2M11): It refers to the basic reserves for which the three-dimensional delineation of the ore body has been established at the locations that have met the work requirements at a detailed exploration stage which has confirmed the continuity of the ore body, and has identified in detail the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining. The results from relevant ore processing and metallurgical tests have been obtained. The results of a feasibility study has demonstrated that extraction is not economic but borders on being so at the time of determination, and will only become economic as a result of improved technical and economic conditions. This section of basic reserves can cover the whole area of detailed exploration, or only part of the detailed exploration area. It can be distributed around or between extractable reserves. The level of confidence is high in the basic reserves that have been calculated and in the results of a feasibility assessment.

**3.4.2.5** measured (prefeasibility study) marginal economic basic reserves (2M21): It refers to the basic reserves for which the three-dimensional delineation of the ore body has been established at the locations that have met the work requirements in the detailed exploration stage, which has confirmed the continuity of the ore body, and has identified in detail of the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining. The results from relevant ore processing and metallurgical performance tests have been obtained. The results of a prefeasibility study have demonstrated that extraction is not economic at the time of determination, but borders on being so. It may become economic in the future as a result of improved technical and economic conditions. Its distribution characteristics are similar to those in 2M11. The level of confidence is high in the basic reserves that have been calculated, but moderate in the results of feasibility assessment.

**3.4.2.6** indicated marginal economic basic reserve (2M22): It refers to the basic reserves for which the preliminary three-dimensional delineation of the ore body has been primarily established at the locations that have met the work requirements in the general exploration stage which has basically identified the geological features of the deposits, ore quality and hydrological, geotechnical and environmental conditions for the mining. The results of a prefeasibility study have demonstrated that extraction is not economic at the time of determination, but borders on being so. It may become eco-

conomic in the future as a result of improved technical and economic conditions. Its distribution characteristics are similar to those in 2M11. The level of confidence is relatively high in the basic reserves that have been calculated, but moderate in the result of feasibility assessment.

**3.4.3 resource:** It consists of 7 subcategories.

**3.4.3.1 measured (feasibility study) submarginal economic resource (2S11):** It refers to the part of the resource which has been explored in the stage of detailed exploration at locations with a measured geological assurance. The results of a feasibility study have demonstrated that extraction is not economic at the time of determination, and would require a substantially higher commodity price or a major cost reduction before it becomes economic. The level of confidence is high in the resources that have been calculated and in the results of a feasibility assessment.

**3.4.3.2 measured (prefeasibility study) submarginal economic resource (2S21):** It refers to the part of the resource which has been explored in the stage of detailed exploration at locations with a measured geological assurance. The results of a prefeasibility study have demonstrated that extraction is not economic at the time of determination, and would require a substantially higher commodity price or a major cost reduction before it becomes economic. The level of confidence is high in the Resources that have been calculated and moderate in the results of a feasibility assessment.

**3.4.3.3 indicated submarginal economic resource (2S22):** It refers to the part of the resource which has been explored in the stage of general exploration at locations with an indicated geological assurance. The results of a prefeasibility study have demonstrated that extraction is not economic at the time of determination, and would require a substantially higher commodity price or a major cost reduction before it becomes economic. The level of confidence is relatively high in the resources that have been calculated and moderate in the results of a feasibility assessment.

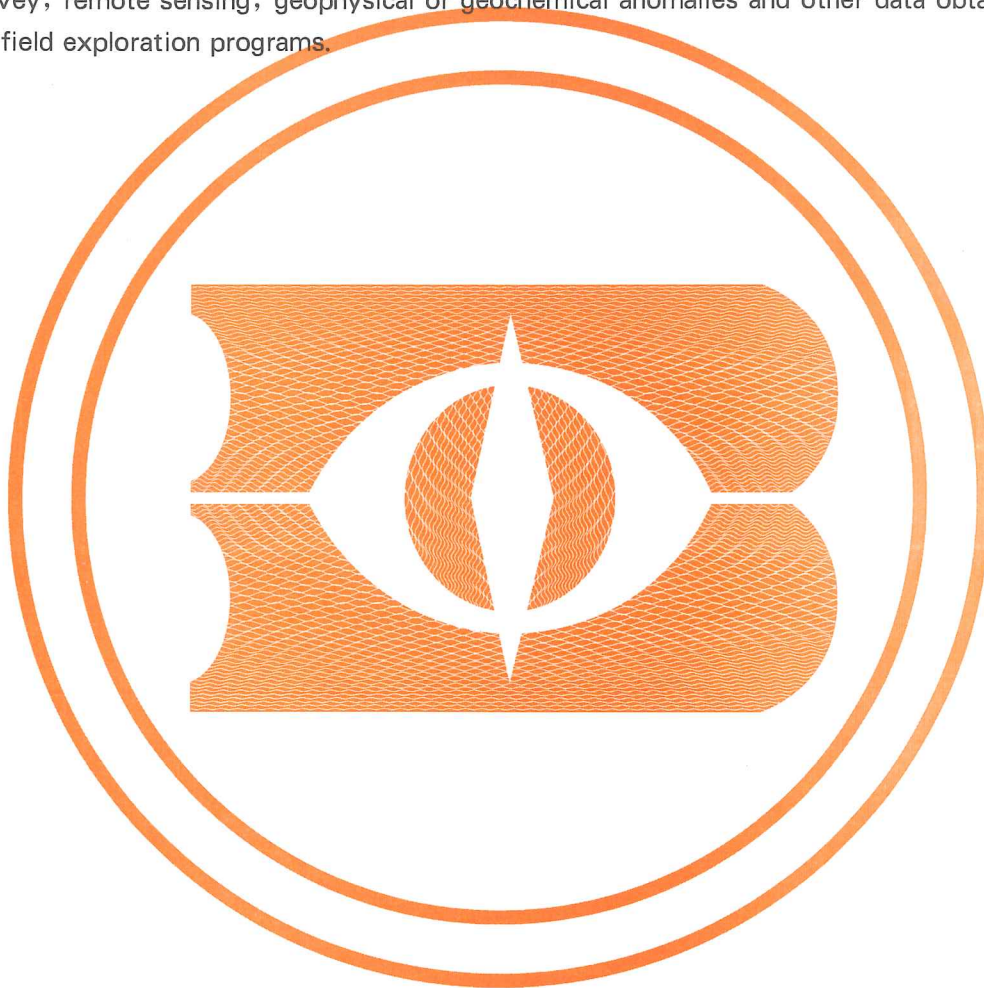
**3.4.3.4 measured intrinsic economic resource (331):** It refers to the part of the resource which has been explored in the stage of detailed exploration at locations with a measured geological assurance. No feasibility or prefeasibility studies but a geological study has been done, which has demonstrated that the degree of economic viability is in the range of economic to submarginal economic. The level of confidence is high in the resources that have been calculated and low in the results of a feasibility assessment.

**3.4.3.5 indicated intrinsic economic resource (332):** It refers to the part of the resource which has been explored in the stage of general exploration at locations with an indicated geological assurance. No feasibility assessment but a geological study has been done, which has demonstrated that the degree of economic viability is in the range of economic to sub-marginal economic. The level of confidence is reasonable in the resources that have been calculated and low in the results of a feasibility assessment.

**3.4.3.6 inferred intrinsic economic resource (333):** It refers to that part of the resource which has been explored as per the requirements of the prospecting stage at locations with an inferred geolog-

ical assurance. The calculation of resources is only based on limited data and has a low level of confidence. No feasibility assessment but a geological study has been done, which has demonstrated that the degree of economic viability is in the range of economic to submarginal economic. The level of confidence is low in the results of a feasibility assessment.

**3.4.3.7 reconnaissance resource (334)?:** It refers to that part of resource of economic interest undefined in the areas with mineralization potential, which are classified as undiscovered resources and estimated based on an analogy with known deposits and the data from regional geological study, airborne survey, remote sensing, geophysical or geochemical anomalies and other data obtained from very rare field exploration programs.



Annex A  
(informative)  
Chinese-English glossary of terms

固体矿产资源	solid fuels and mineral resources
查明矿产资源	total identified mineral resources
潜在矿产资源	undiscovered resources
储量	extractable reserve
可采储量	proved extractable reserve
预可采储量	probable extractable reserve
基础储量	basic reserve
资源量	resource
预查	reconnaissance
普查	prospecting
详查	general exploration
勘探	detailed exploration
矿化潜力	mineralization potential
地质可靠程度	geological assurance
预测的	reconnaissance
推断的	inferred
控制的	indicated
探明的	measured
可行性评价	feasibility assessment
概略研究	geological study
预可行性研究	prefeasibility study
可行性研究	feasibility study
采矿报告	mining report
经济意义	degree of economic viability
经济的	economic
边际经济的	marginal economic
次边际经济的	submarginal economic
内蕴经济的	intrinsic economic
经济意义未定的	economic-interest undefined

**Annex B**  
(informative)

**A brief comparison between mineral resource classifications  
of china and other countries**

**Table B.1—A brief comparison between mineral resource classifications of  
China and other countries**

Standard	Comparison of Classifications			
This standard (1999)	total identified mineral resources			undiscovered resources
	extractable reserve	basic reserve		resource
	proved extractable reserve probable extractable reserve	economic basic reserve	marginal economic basic reserve	submarginal economic resource, intrinsic economic resource
<i>General requirements for solid mineral exploration—National Standard of the People's Republic of China GB 13908—1992</i>	usable reserves			reconnaissance resource
	subcategory a	subcategory b	currently unusable reserves	
U.N. <i>Economic and social commission</i> ENERGY/WP.1/R.70 Document	total mineral resource			
	proved mineral reserves probable mineral reserves	feasibility mineral resources pre-feasibility mineral resources measured mineral resources indicated mineral resources inferred mineral resources		reconnaissance mineral resources
CMMI System (1997)	proved mineral reserves probable mineral reserves	measured mineral resources indicated mineral resources inferred mineral resources		mineral potentials
<i>The principles of a resource/reserve classification for minerals (U.S. Geological Survey, 1980)</i>	identified resources			undiscovered resources
	economic reserves  marginal economic reserves	economic-marginal economic basic reserves		sub-marginal economic resources
				hypothetical resources  speculative resources

**Annex C**  
**(informative)**

**Main items to be addressed in a feasibility study**

A feasibility study for an industrial project is generally required to address the following main items.

**C.1 Executive summary**

C.1.1 Project background (or current business profile for expansion and reconstruction projects), investment justification and economic viability.

C.1.2 Grounds and scope.

**C.2 Predicted demands and proposed scale**

C.2.1 Predicted demands in China and other countries.

C.2.2 Estimated production capacity of existing factories in China.

C.2.3 Predicted sales, price analysis, competitiveness of products and the prospect of entering international markets.

C.2.4 Proposed project scale and the technical and economic comparison and analysis of the plans and the directions of product development.

**C.3 Resources, raw material, fuels and utilities**

C.3.1 A description of the grade, composition, extraction and utilization conditions of the Reserves which have been officially approved by the Reserves Committee.

C.3.2 Types, quantities, sources and possible supplies of raw material, auxiliary material and fuels.

C.3.3 Quantity of public utilities required and the method and conditions of supply.

**C.4 Construction conditions and site selection**

C.4.1 Geographical, meteorological, hydrological, geological, topographical conditions and the current socio-economic conditions for the site.

C.4.2 Existing transport, water, electricity, gas and other supporting infrastructure and future development trends.

C.4.3 Site comparison and selection recommendations.

## C.5 Design proposals

C.5.1 Scope of project composition (i.e. main individual projects included), technical sources and production methods, comparison between main options for technologies, processes and equipment, sources and countries of origin of introduced technologies and equipment, proposed batch delivery of equipment in China or abroad or manufacturing in partnership with foreign companies. For expansion and reconstruction projects, the utilization of the original fixed assets also needs to be addressed.

C.5.2 Preliminary options of the whole-plant layout plan and estimation of civil engineering works.

C.5.3 Comparison and preliminary selection of auxiliary public utilities and modes of transportation within and outside the plants.

## C.6 Environmental protection

A study needs to be conducted on the current environmental conditions and predicted environmental impact of the project before a preliminary proposal is made on environmental protection and the treatment of waste.

## C.7 Enterprise organization, staffing and staff training (estimates)

## C.8 Proposed implementation schedule

## C.9 Estimation of investment and funding

C.9.1 Investment required for the main project and auxiliary projects.

C.9.2 Estimation of circulating funds for production.

C.9.3 Sources of funds, methods of funding and loan repayments.

## C.10 Social-economic performance assessment

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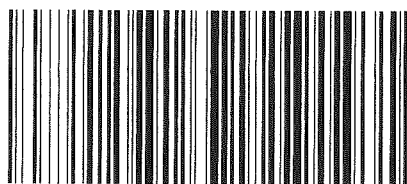
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