United Nations ECE/ENERGY/GE.3/2022/16

# Economic and Social Council

Distr.: General
15 March 2022

English only

## Economic Commission for Europe

Committee on Sustainable Energy

**Thirteenth session**
Geneva, 25-29 April 2022
Item 9 of the provisional agenda
**Development, maintenance and implementation of the United Nations Framework Classification for Resources**

# Bridging Document between the National Standard of the People's Republic of China Classification for Mineral Resources and Mineral Reserves (GB/T 17766-2020) and the United Nations Framework Classification for Resources

**Prepared by a Joint Working Group led by the Mineral Resources and Reserves Evaluation Center of the Ministry of Natural Resources of the People's Republic of China in cooperation with the Technical Advisory Group of the Expert Group on Resource Management***

*Summary*

This Bridging Document provides the mapping between the National Standard of the People's Republic of China Classification for Mineral Resources and Mineral Reserves (GB/T 17766-2020) and the United Nations Framework Classification for Resources (UNFC Update 2019, hereinafter referred to as UNFC). Bridging documents explain the relationship between UNFC and another classification system that has been endorsed by the Expert Group on Resource Management as an Aligned System. They incorporate instructions and guidelines on how to classify estimates generated by the Aligned Systems using the UNFC Numerical Codes. This Bridging Document compares mineral resources and mineral reserves by categories and classes of GB/T 17766-2020 to UNFC categories and classes. GB/T 17766-2020 was issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China and the Standardization Administration of the People's Republic of China on 31 March 2020, and implemented on 1 May 2020. It establishes unified guidance regarding China's principles for evaluation, auditing and reporting of reserves and resources of minerals. This Bridging Document does not affect the independent application of GB/T 17766-2020 and the application of GB/T 17766-2020 does not affect any component of UNFC as well. In the event of any difference between the Chinese version and any other language version, the Chinese version shall prevail.

* This Bridging Document is prepared by a Joint Working Group led by the Mineral Resources and Reserves Evaluation Center of the Ministry of Natural Resources of the People's Republic of China in cooperation with the Technical Advisory Group of the Expert Group on Resource Management of the United Nations Economic Commission for Europe (ECE). This Bridging Document is drafted by Mr. JU Jianhua, Mr. LI Jian, Mr. YANG Qiang, Mr. LIU Yongqiang, Mr. LI Shengxiang, Ms YANG Hua, Mr. FENG Tao, Mr. Alistair Jones, Mr. Andrew Barrett, Mr. Roger Dixon, Mr. Brad Van Gosen and Ms. Charlotte Griffiths.

# Contents

# I. Introduction

1. This Bridging Document details the correlation between the People's Republic of China Classification for Mineral Resources and Mineral Reserves (GB/T 17766-2020) (hereinafter referred to as GB/T 17766-2020) and the United Nations Framework Classification for Resources (UNFC Update 2019, hereinafter referred to as UNFC).

2. This Bridging Document is developed on the basis of the Bridging Document between the National Standard of the People's Republic of China Classification for Resources/Reserves of Solid Fuels and Mineral Commodities (GB/T 17766-1999) and the United Nations Framework Classification for Resources (UNFC 2009), which was jointly issued in September 2018 by the Ministry of Natural Resources of the People's Republic of China (MNR) and the United Nations Economic Commission for Europe (ECE).

3. GB/T 17766-2020 is independent of UNFC. This Bridging Document does not affect the independent application of GB/T 17766-2020.

4. The application of GB/T 17766-2020 does not affect any component of UNFC.

# II. Overview of GB/T 17766-2020

5. In view of key and prominent problems in implementation, and with the aim of meeting the new needs of China's mineral resource-related fields, GB/T 17766-2020 has been developed on the basis of summarizing 20 years of practical experience in the Classification for Resources/Reserves of Solid Fuels and Mineral Commodities (GB/T 17766-1999). GB/T 17766-2020 provides the relevant definitions of mineral resources, mineral reserves, and other terms that stipulate the classification, relationships of mineral resources and mineral reserves, and guidelines for reporting and use of the relevant terminologies. GB/T 17766-2020 is applicable to the statistics and reporting of mineral resource, the governance, planning, and policymaking for mineral resources, and the formulation of technical standards in relation to mineral exploration and exploitation, as well as the estimation, evaluation, and disclosure of mineral resources and mineral reserves.

6. Compared with GB/T 17766-1999, the main technical changes of GB/T 17766-2020 are as follows:

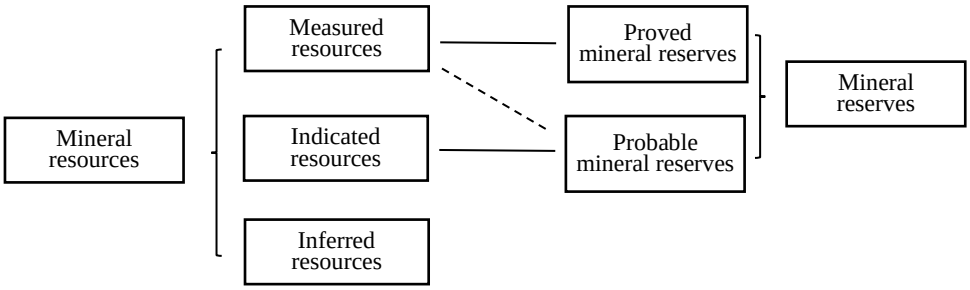
(a) The stages of mineral exploration are adjusted from the original four stages (reconnaissance, prospecting, general exploration, and detailed exploration) to three stages (general exploration, detailed exploration, and advanced exploration);

(b) The basis for the classification of mineral resources and mineral reserves was redefined. Mineral resources are classified on the basis of geological confidence, whereas mineral reserves are classified according to the confidence in modifying factors, such as mining, processing, metallurgy, infrastructure, economics, market, legal, environment, community, and government policy, with consideration of geological confidence;

(c) The classification system for mineral resources and mineral reserves was simplified.

7. To meet the need of management of mineral resources, GB/T 17766-2020 also provides a definition of mineral resource. Depending on whether it was identified by direct evidence, or not, mineral resource can be classified into either an **identified mineral resource** or an **undiscovered mineral resource**. Depending on whether it is expected to be economically extracted, or not, identified mineral resource can be further classified into two sub-classes: **mineral resources** and **non-exploitable mineral resource**. Additionally, according to GB/T 17766-2020, mineral resources are subdivided into three levels from low to high according to the geological confidence - **inferred resources**, **indicated resources**, and **measured resources**. On the basis of geological confidence and degree of reliability of modifying factors (based on pre-feasibility or feasibility study, or equivalent), measured resources can be converted to **proved mineral reserves or probable mineral reserves,** while indicated resources can be converted to **probable mineral reserves**. The classification of mineral resources and mineral reserves and their conversion relationships are shown in Figure I. Non-exploitable mineral resource is not subdivided according to the geological confidence.

Figure I
**Classification of Mineral Resources and Mineral Reserves and their Conversion Relationships**




# III. Overview of UNFC

8. UNFC[1] was developed under the auspices of ECE and published by ECE. As a classification system, UNFC is applicable to minerals, petroleum, nuclear fuel, renewable energy, and anthropogenic resources, as well as groundwater and injection projects for geological storage.

9. UNFC aims to satisfy the requirements of different resource sectors and applications, as well as supporting attainment of the 2030 Agenda for Sustainable Development. Compared with the 2009 version, the 2019 version of UNFC does not change the classification system but makes the key change of including the normalization of the terminology to make UNFC applicable to all resource sectors.

10. UNFC is a principles-based system in which the products of a resource project are classified on the basis of the three fundamental criteria, which are environmental-socio-economic viability (E), technical feasibility (F), and degree of confidence (G), using a numerical coding system. Combinations of these criteria create a three-dimensional system in which a resource is classified according to all three criteria: E, F, and G (Figure II)[2] Categories (e.g. E1, E2, E3) and, in some cases, Sub-categories (e.g. E1.1, E1.2) are defined for each of the three criteria.

Figure II
**UNFC Classes and Sub-classes Defined by Sub-categories**

<table>
<tr><td rowspan="12">Total products</td><td rowspan="2">Produced</td><td colspan="5">Sold or used production</td></tr>
<tr><td colspan="5">Production which is unused or consumed in operations</td></tr>
<tr><td colspan="2" rowspan="2">Class</td><td rowspan="2">Sub-class</td><td colspan="3">Categories</td></tr>
<tr><td>E</td><td>F</td><td>G</td></tr>
<tr><td rowspan="8">Known Sources</td><td rowspan="3">Viable Projects</td><td>On Production</td><td>1</td><td>1.1</td><td>1,2,3</td></tr>
<tr><td>Approved for Development</td><td>1</td><td>1.2</td><td>1,2,3</td></tr>
<tr><td>Justified for Development</td><td>1</td><td>1.3</td><td>1,2,3</td></tr>
<tr><td rowspan="2">Potentially Viable Projects</td><td>Development Pending</td><td>2</td><td>2.1</td><td>1,2,3</td></tr>
<tr><td>Development On Hold</td><td>2</td><td>2.2</td><td>1,2,3</td></tr>
<tr><td rowspan="2">Non-Viable Projects</td><td>Development Unclarified</td><td>3.2</td><td>2.2</td><td>1,2,3</td></tr>
<tr><td>Development Not Viable</td><td>3.3</td><td>2.3</td><td>1,2,3</td></tr>
<tr><td colspan="2">Remaining products not developed from identified projects</td><td>3.3</td><td>4</td><td>1,2,3</td></tr>
<tr><td rowspan="2">Potential Sources</td><td>Prospective Projects</td><td>No sub-classes defined</td><td>3.2</td><td>3</td><td>4</td></tr>
<tr><td colspan="2">Remaining products not developed from prospective projects</td><td>3.3</td><td>4</td><td>4</td></tr>
</table>

[1] See more information at: https://unece.org/sustainable-energy/unfc-and-sustainable-resource-management

[2] https://www.unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf

# IV. Direct Mapping of Classes and Categories

## A. Alignment of the G Axis

11. In GB/T 17766-2020, mineral resources are subdivided into measured resources, indicated resources, and inferred resources reflecting the level of geologic confidence from high to low, respectively. The geologic confidence is based on the reliability of geological continuity of the outlined orebody in terms of spatial distribution, shape, orientation, ore quality, and other factors, as well as the continuity of the grade or quality. The significant factor in reliability of geological continuity is the level of sampling (spacing, drilling versus outcrop, number of samples and analyses, for example).

12. In UNFC, the G Axis designates the degree of confidence in the estimate of the quantities of products that could be generated from the project in the future. Projects associated with Known Sources (i.e. those which have been discovered) are subdivided into three levels of confidence (G1, G2, G3), whilst Prospective Projects, which are associated with Potential Sources, are categorized as G4.

13. Purely mapping from the degree of confidence in the estimate, the geological confidence of three-level mineral resources in GB/T 17766-2020 can approximately correspond to G1, G2, and G3 in UNFC, respectively.

## B. Alignment between the E and F Axes

14. In GB/T 17766-2020, mineral resources refer to the mineral resource in place that is identified by mineral exploration and has the potential to be economically extracted following a scoping study that considers mining, processing, metallurgy, infrastructure, economics, market, legal, environment, community, and government policy factors of a project. Mineral reserves refer to the economically mineable part of measured resources and/or indicated resources. Mineral reserves are estimated based on a pre-feasibility study, a feasibility study, or an equivalent economic assessment, taking into account the allowance for mining losses and dilution, and applying relevant modifying factors, such as mining, processing, metallurgy, infrastructure, economics, market, legal, environment, community, and government policy.

15. The factors to be considered in the combination of the E Axis and the F Axis of UNFC include environmental and social factors, and economic, legal and other none-technical factors (E Axis), and various technical factors required for the project implementation (F Axis). According to the project maturity, the projects associated with a Known Source are classified into Viable Projects, Potentially Viable Projects, or Non-Viable Projects (Figure II).

16. If definitions are compared, mineral resources of GB/T 17766-2020 correspond to the Potentially Viable Projects of UNFC, as shown in Figure III and Figure IV. On the basis of project maturity, the Potentially Viable Projects of UNFC are further classified into two sub-classes, which are Development Pending Projects and Development on Hold Projects. Mineral resources in GB/T 17766-2020 are not classified into sub-classes; however, the status of Development on Hold Projects and Development Pending Projects does exist in mineral resource development projects. These two sub-classes of projects may include measured resources, indicated resources, or inferred resources as defined in GB/T 17766-2020.

17. Comparing definitions, mineral reserves of GB/T 17766-2020 correspond to the Viable Projects of UNFC, as shown in Figure III and Figure IV. Based on the project maturity, the Viable Projects of UNFC can be further classified into three sub-classes, which are On Production, Approved for Development, and Justified for Development. Although mineral reserves of GB/T 17766-2020 are not classified into sub-classes, mineral reserves are bound to exist in the projects classified as On Production, Approved for Development, or Justified for Development. These projects may include proved mineral reserves and/or probable mineral reserves.

18. Comparing definitions, the non-exploitable mineral resource, defined in Annex A of GB/T 17766-2020, corresponds to the Development Unclarified Projects or Development not Viable Projects in UNFC. The non-exploitable mineral resource in GB/T 17766-2020 is the identified mineral resource that currently (or in the foreseeable future) does not have conditions ready for economic extraction when considering, among other things, mining, processing, metallurgy, infrastructure, economics, market, legal, environment, community, and government policy factors. The Categories of non-exploitable mineral resource are not defined in GB/T 17766-2020 (See Figure III).

19. The undiscovered mineral resource defined in Annex A of GB/T 17766-2020 corresponds to Prospective Projects in UNFC. The undiscovered mineral resource in GB/T 17766-2020 is the mineral resource that has not been discovered, but is permissible based on favorable geologic features and characteristic setting. The mineral resource may be predicted based on indications that can include regional geology research, remote sensing, geophysics and geochemistry data, for example, and occasionally from very sporadic sampling as well. Data on the quantity and quality, spatial distribution, and conditions for extraction of the mineral resource are either not obtained or too scarce to reach conclusions on their prospects. The Categories of undiscovered mineral resource are not defined in GB/T 17766-2020 (see Figure III).

20. GB/T 17766-2020 has no relevant definition of Production which is unused or consumed in operations, or of Remaining products not developed from identified or prospective projects, as are defined in UNFC.

21. Mineral resources, as defined in GB/T 17766-2020, refers to the quantities in place, including the quantities anticipated to be extracted in the future and the relevant loss. This definition is different from the quantities of products in the future defined in UNFC. In this case, attention should be paid when using the Bridging Document. When the quantities of mineral resources estimated according to GB/T 17766-2020 need to be converted into quantities of products in the future as defined in UNFC, the losses should be deducted from the quantities of mineral resources and vice versa when converting from UNFC to GB/T 17766-2020.

22. In situations where estimates for both mineral resources and mineral reserves are reported in GB/T 17766-2020, a statement shall be included in the report which clearly indicates whether the mineral resources are inclusive of, or additional to the mineral reserves.

23. The Bridging Document was developed based on the definitions of the two classification systems. When using the Bridging Document, the correlations of the Classes or Categories between GB/T 17766-2020 and UNFC should be adjusted as required based on actual conditions at that time.

Figure III
**Mapping GB/T 17766-2020 and UNFC Classes and Categories**

| *Classes and Categories in GB/T 17766-2020* | | | | *UNFC Classes and Sub-classes* | | *UNFC "Minimum" Levels* | | |
|---|---|---|---|---|---|---|---|---|
| Mineral reserves | Proved Mineral reserves | Probable Mineral reserves | Not defined | Viable Projects | On Production | E1 | F1.1 | G1,G2 |
| | | | | | Approved for Development | E1 | F1.2 | G1,G2 |
| | | | | | Justified for Development | E1 | F1.3 | G1,G2 |
| Mineral resources | Measured resources | Indicated resources | Inferred resources | Potentially Viable Projects | Development Pending | E2 | F2.1 | G1,G2,G3 |
| | | | | | Development On Hold | E2 | F2.2 | G1,G2,G3 |
| Non-exploitable mineral resource | Not defined | | | Non-Viable Projects | Development Unclarified | E3.2 | F2.2 | G1,G2,G3 |
| | | | | | Development Not Viable | E3.3 | F2.3 | G1,G2,G3 |
| Undiscovered mineral resource | Not defined | | | Prospective Projects | Not defined | E3.2 | F3 | G4 |

Figure IV
**Mapping GB/T 17766-2020 and UNFC by the E and F Axes**

| | F1.1 | F1.2 | F1.3 | F2.1 | F2.2 | F2.3 | F3 | F4 |
|---|---|---|---|---|---|---|---|---|
| E1.1 | 1 | 2 | 3 | 4 | | | | |
| E1.2 | 1 | 2 | 3 | | | | | |
| E2 | | | 4 | 4 | 5 | | | |
| E3.1 | 10 | 10 | 10 | 10 | 10 | 10 | | |
| E3.2 | | | 6 | 6 | 6 | | 8 | |
| E3.3 | | | | | | 7 | | 9 |

*Note:*

(1) It is a common practice for UNFC to bridge with other classification systems for resources/reserves (such as PRMS or the CRIRSCO Template, etc.) by using a matrix and adopting color blocks and the digital codes in the figure to represent the combined relationship between E Axis and F Axis. The digital codes do not belong to the components of GB/T 17766-2020 or UNFC classifications.

(2) Sub-categories of E and F are defined in UNFC. E1.1 denotes that development is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions. E1.2 denotes that development is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations. E3.1 denotes a portion of the product that is forecast to be developed, but which will be unused or consumed in operations. For detailed definitions of other Sub-categories of E and F in UNFC, refer to https://unece.org/sustainable-energy/unfc-and-sustainable-resource-management.

Figure IV (*continued*)
**Mapping GB/T 17766-2020 and UNFC by the E and F Axes**

| *GB/T 17766-2020* | *Digital Codes* | *UNFC Sub-classes* |
|---|---|---|
| Mineral reserves | 1 | On Production |
| | 2 | Approved for Development |
| | 3 | Justified for Development |
| Mineral resources | 4 | Development Pending |
| | 5 | Development On Hold |
| Non-exploitable mineral resource | 6 | Development Unclarified |
| | 7 | Development Not Viable |
| Undiscovered mineral resource | 8 | Prospective Projects |
| Not defined | 9 | Remaining products not developed from identified projects or prospective projects |
| | 10 | Production which is unused or consumed in operations |

*Note:*

The color blocks and digital codes in the Figure represent the combinations of E and F Categories of UNFC, and they are used to indicate the relationships between GB/T 17766-2020 and UNFC's E and F axes. The specific relationships are shown in the E-F matrix of Figure IV. Unnumbered cells in the E-F matrix are combinations of UNFC Categories which do not occur in GB/T 17766-2020.