United Nations ECE/ENERGY/GE.3/2022/17

Economic and Social Council

Distr.: General
17 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 Petroleum Resources/Reserves (GB/T 19492-2020) 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 Petroleum Resources/Reserves (GB/T 19492-2020) 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 reserves and resources by Categories of GB/T 19492-2020 to UNFC Categories and Classes. GB/T 19492-2020 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 crude oil, natural gas and gas condensate. This Bridging Document does not affect the independent application of GB/T 19492-2020 and nor does the application of GB/T 19492-2020 affect any component of UNFC. 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 in 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). The main contributors are Mr. JU Jianhua, Ms YANG Hua, Mr. LI Jian, Mr. ZHANG Daoyong, Ms YI Yanjing, Mr. Alistair Jones, Mr. Dominique Salacz, Mr. Jan Bygdevoll and Ms. Charlotte Griffiths.

Contents

I. Introduction

1. Bridging Documents explain the relationship between the United Nations Framework Classification for Resources (UNFC Update 2019, hereinafter referred to as "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 application of that Aligned System using the UNFC Numerical Codes. The relevant Bridging Document shall be identified when reporting estimates using the UNFC Numerical Codes.

2. This document compares reserves and resources by categories of the National Standard of the People's Republic of China "Classifications for Petroleum Resources and Reserves" (GB/T 19492-2020) hereinafter referred to as "GB/T 19492-2020" with Categories and Classes of UNFC.

3. GB/T 19492-2020 was issued by the Standardization Administration of the People's Republic of China under the General Administration of Quality Supervision, Inspection and Quarantine 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 crude oil, natural gas and gas condensate.

4. GB/T 19492-2020, the enforced guidelines for the reporting of oil and gas reserves to the Chinese Government, is independent of UNFC. This Bridging Document does not affect the independent application of GB/T 19492-2020. The application of GB/T 19492-2020 does not affect any component of UNFC.

II. Overview of GB/T 19492-2020

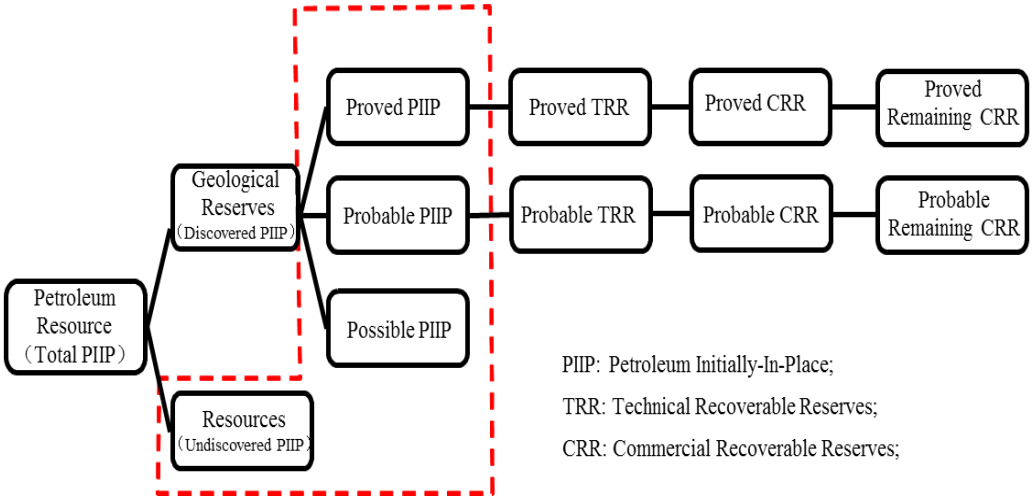
5. GB/T 19492-2020 is an updated version of GB/T 19492-2004, which incorporated the practical experience achieved over the past 17 years and meets the Government's new administration requirements. From the national administration perspective, GB/T 19492-2020 defines the key terms used for the management of the petroleum resource endowment, establishes resource classification principles and provides general regulations for reporting at the national level. It serves as the leading standard of the whole set of technical standards on petroleum resource management in China, and has been developed to guide the management and planning, policy making, exploitation activities, the formation of technical standards, and the evaluation, statistics and reporting of petroleum resources and reserves at a national level.

6. This update does not change the classification scheme (see the dashed box in Figure I), and hence does not impact the current application. The key changes, including the simplification and normalization of the text, are intended to make application easier for national reporting. The main changes adopted in the updated GB/T 19492-2020 are as below:

- The whole exploration and development (E&D) lifecycle is simplified from the original five phases in GB/T 19492-2004 into three, including the exploration phase, appraisal phase and development phase
- The national administration of petroleum resources is based on geological reserves and resources. In GB/T 19492-2020, geological reserves are divided into Possible, Probable and Proved Petroleum Initially-In-Place (PIIP) categories in accordance with geological confidence and no categories are defined for resources
- It will be the contractor's duty to estimate Technical Recoverable Reserves (TRR) based on their technical capacities and evaluate Commercial Recoverable Reserves (CRR) in accordance with relevant specifications and standards.[1]

[1] GB/T 19492-2020 *Classifications for Petroleum Resources and Reserves, DZ/T 0344-2020 General Specifications for Petroleum exploration, DZ/T 0217-2020 Regulations for Petroleum Reserves Estimation, DZ/T 0252-2020 Regulation for Offshore Petroleum Reserves Estimation, & etc.*

Figure I
Classification Framework and Estimated Workflow for Petroleum Resources and Reserves



7. In GB/T 19492-2020, resource classification is mainly based on the exploration and development (E&D) phases and geological confidence. Vertically, Total PIIP is divided into two major classes according to the status of discovery: Geological Reserves (Discovered PIIP) and Resources (Undiscovered PIIP). Categories are no longer defined for Resource at the national level whilst Geological Reserves are further classified into Proved PIIP, Probable PIIP and Possible PIIP. Horizontally, three major categories are defined based on in-situ attributes, recoverability and commerciality for petroleum reserves: PIIP, TRR and CRR.

A. Horizontal: from left to right

8. Total Petroleum Initially-In-Place (Total PIIP) refers to the total oil and gas quantities existing initially in natural accumulations in the earth's crust, which are represented by quantities, quality and spatial distribution at the standard conditions of 20℃and 0.101MPa. Total PIIP is classified as Resources (Undiscovered Petroleum Initially-In-Place) and Geological Reserves (Discovered Petroleum Initially-In-Place) which are further categorized into Proved, Probable and Possible PIIP.

9. Technical Recoverable Reserves (TRR) are the volumes that can technically be recovered from the reservoirs. The difference between PIIP and TRR defines the Unrecoverable Quantity (UQ).

10. Commercial Recoverable Reserves (CRR), refer to those quantities of petroleum which are estimated to be commercially recoverable from accumulations. In accordance with mass balance, Remaining CRR is the difference between CRR and cumulative production; and Sub-Commercial Reserves (SCR) is the difference between TRR and CRR.

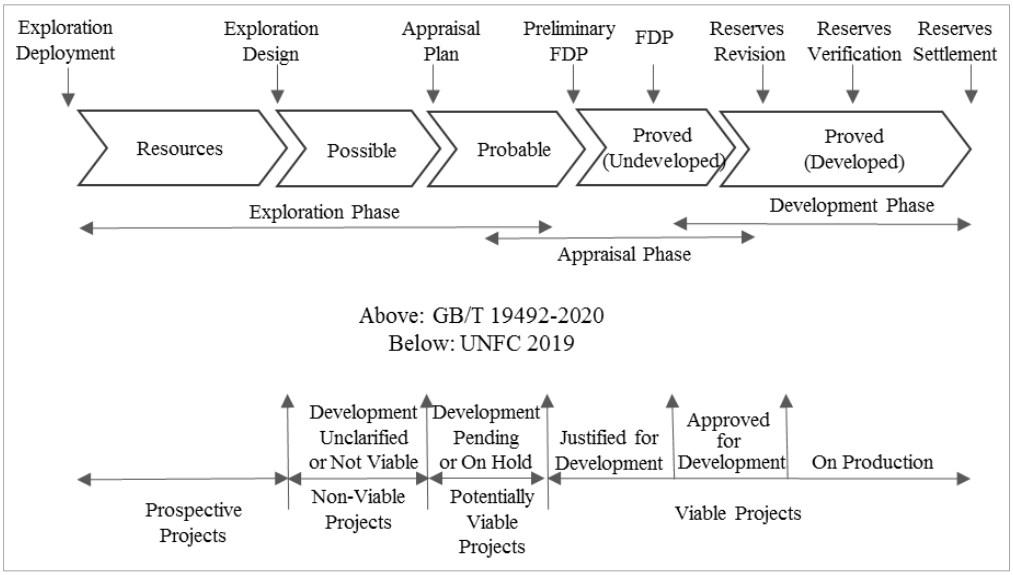
B. Vertical: from top to bottom

11. To better meet the Government's administrative requirements on natural resource endowments, the overall resource estimation and classification per GB/T 19492-2020 are conducted at a reservoir or field level.

12. The Geological Reserves are assigned to one of three categories: Proved, Probable or Possible. They reflect the degree of geological confidence: low, moderate or high respectively.

13. Based on the operational maturity, the overall Exploration and Development Phases are divided into the Exploration Phase, the Appraisal Phase and the Development Phase, reflecting geological confidence: low, moderate or high respectively.

Figure II
Classification Corresponds to the Exploration and Development Phases and the Decision-Making Process



C. In-Place Volumes

14. Resources (Undiscovered Petroleum Initially-In-Place): refers to the total quantities of oil and gas predicted by integrated geological study in unknown accumulations without existing wells.

15. Geological Reserves (Discovered Petroleum Initially-In-Place): refers to the total oil and gas quantities estimated based on seismic, drilling, well logging and test data in known reservoirs/fields after oil and gas are found by drilling. It can be categorized as Possible PIIP, Probable PIIP and Proved PIIP based on project maturity and geological knowledge:

- Possible Petroleum Initially-In-Place: refers to the Geological Reserves that are estimated during the Exploration Phase with a low level of confidence when oil and/or gas flows are obtained from a wildcat well or the integrated interpretation indicates the probable existence of oil and/or gas layers. Further exploration will be required. The Possible PIIP is estimated under the preconditions that: (i) the structural configurations and reservoir conditions should be preliminarily ascertained; and (ii) a wildcat has obtained oil and/or gas flows or encountered oil and/or gas layers, or the reservoir/field is immediately adjacent to Proven (or Probable) oil and/or gas zones, which show further exploration potential through comprehensive analysis
- Probable Petroleum Initially-In-Place: refers to the Geological Reserves that are estimated with a moderate level of confidence after industrial oil or gas flows are obtained from a prospecting well during the Exploration or Appraisal Phase. The volumes will be categorized as Probable PIIP under the conditions that: (i) Preliminary studies have provided information about the structural configuration, reservoir formation continuity, oil and gas distribution, reservoir type, fluid properties and productivities, etc.; (ii) the level of geological confidence is moderate; and (iii) it can be used as evidence for drilling reservoir appraisal wells and making conceptual design or development plans
- Proved Petroleum Initially-In-Place: refers to the Geological Reserves that have been proved economically recoverable by appraisal drilling during the Appraisal phase. The volumes are estimated with a high level of confidence. The volumes will be categorized as Proved PIIP if: (i) the reservoir type, depositional environment, drive mechanism, fluid properties and distributions, and productivities etc. are known; (ii) fluid contacts or the lowest known hydrocarbons are determined by drilling, logging and testing data or reliable pressure data; (iii) reasonable well control or a primary

development well pattern designed in a development plan are available; and (iv) all parameters have a high level of certainty. If the conditions above are met, a Final Investment Decision is expected for the development of the asset and proved CRR can be estimated.

D. Technical Recoverability

16. In the GB/T 19492-2020, “Proved” “Probable” and “Possible” are categories of Discovered PIIP within a reservoir based on different geological confidences. “Proved”, “Probable” and “Possible” are also assigned for the recoverable portions respectively. **It should be noted that this terminology is NOT linked to the meanings given for “Proved”, “Probable” and Possible” in guidelines such as COGEH, PRMS, U.S. SEC.**

17. Technical Recoverable Reserves (TRR) are those volumes of petroleum which are estimated theoretically or by the use of analogues to be recoverable from discovered accumulations under given technological conditions. National resources management mainly focuses on the Proved and Probable categories:

- Probable TRR: refers to the technically ultimate recovery associated with Probable PIIP, meeting the following requirements: (i) All requirements and maturity for the Probable PIIP have been met; (ii) The applicable technology is available and likely to be implemented; (iii) The feasibility studies show the development is above sub-economic
- Proved TRR: refers to the technically ultimate recovery associated with Proved PIIP, meeting the following requirements: (i) All requirements and maturity for the Proved PIIP have been met; (ii) The technology (including oil and/or gas production technology and enhanced recovery technology) has been demonstrated by pilot projects, or the recovery technology has been used successfully in analogous reservoirs; (iii) The conceptual design or development plan is available, and the development has been implemented or will be implemented in the near future; (iv) The feasibility studies show the development has potential for commerciality.

E. Commerciality

18. Commercial Recoverable Reserves (CRR): are those quantities of petroleum which are anticipated to be commercially recoverable from discovered accumulations under existing economic conditions (such as prices, costs, etc.) or economic conditions defined by relevant contract, and under currently executed or planned-to-be-established technical operating conditions. National resources management requests probable CRR and proved CRR:

- Probable Commercial Recoverable Reserves (Probable CRR): refer to the commercial ultimate recovery, associated with Probable TRR, meeting the following requirements: (i) All requirements and maturity for the Probable TRR have been met; (ii) The preliminary feasibility studies show the development is commercial; (iii) There should be at least a 50% probability that the quantities recovered in the future will equal or exceed the estimated CRR
- Proved Commercial Recoverable Reserves (Proved CRR), refer to the commercial ultimate recovery, associated with Proved TRR, meeting the following requirements: (i) All requirements and maturity for the Proved TRR have been met; (ii) The applicable technology has been implemented, or the applicable technology has been demonstrated by pilot projects and is virtually certain to be implemented, or the applicable technology has been applied successfully in analogous reservoirs in the same field and is virtually certain to be implemented; (iii) The development plan is available, and it will be carried out in the near future; (iv) Export facilities are or will be made available. For gas, there should be an existing gas pipeline or gas pipeline construction agreement, as well as a sales contract or agreement; (v) The reserve boundaries are based on the fluid contacts confirmed by drilling or reliable pressure

test data, or the lowest known hydrocarbons encountered in the well, and within the boundaries of reasonable well control; (vi) The economic productivity has been demonstrated by actual production or by a conclusive test, or the productivity in the formation is confirmed by analogy with offset wells or a similar formation in the same well which has economic production; (vii) Feasibility studies show the development is economic based on prices and costs stipulated in the contracts or agreements and relevant economic conditions; (viii) There should be at least 80% probability that the quantities actually recovered in the future will equal or exceed the estimated CRR.

F. Development Status

19. According to whether it is developed or not, a reservoir/field can be assigned Developed or Undeveloped status:

- Developed: according to the field development plan and productivity construction, at least 70% of the development well pattern has been implemented
- Undeveloped: the appraisal drilling is completed but the development well pattern has not been deployed, or less than 70% of the development well pattern has been implemented.

20. By GB/T 19492-2020, the general approach of resources and reserves estimation is to estimate PIIP and TRR first, and then conduct commerciality analysis for Proved TRR or Probable TRR to distinguish CRR and Sub-Commercial Reserves (SCR).

III. Overview of UNFC

21. UNFC[2] is a global, principles-based system for classifying mineral, petroleum, nuclear fuel, renewable energy, water, anthropogenic resources and injection projects. UNFC was developed by the Expert Group on Resource Management of the United Nations Economic Commission for Europe (ECE) and was issued by ECE.

22. UNFC is intended to satisfy the requirements of different resource sectors and stakeholders, as well as supporting attainment of the 2030 Agenda for Sustainable Development. Compared with UNFC, the updated 2019 version does not change the classification system and the key change is the normalization of the terminology so that it is applicable to all resources.

23. UNFC is a generic principle-based system in which quantities are classified based on three fundamental criteria: environmental-socio-economic viability (E), technical feasibility (F), and degree of confidence (G), using a three-dimensional numerical independent coding scheme (Table 1).[3]

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

[3] Source from Figure 3 of UNFC Update 2019.

Table 1
UNFC Classes and Sub-classes Defined by Sub-categories

Total products	*Produced*	*Sold or used production*				
		Production which is unused or consumed in operations				
	Classes		*Sub-Classes*	*Categories*		
				E	F	G
	Known Sources	Viable Projects	On Production	1	1.1	1,2,3
			Approved for Development	1	1.2	1,2,3
			Justified for Development	1	1.3	1,2,3
		Potentially Viable Projects	Development Pending	2	2.1	1,2,3
			Development On Hold	2	2.2	1,2,3
		Non-Viable Projects	Development Unclarified	3.2	2.2	1,2,3
			Development Not Viable	3.3	2.3	1,2,3
		Remaining products not developed from identified projects		3.3	4	1,2,3
	Potential Sources	Prospective Projects	[No sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

IV. Mapping Directly

A. G Axis

24. In UNFC, the recoverable quantities and the remaining products not developed from identified projects (Unrecoverable Quantities) within known sources (discovered deposits) are categorized into high, moderate or low levels of confidence, represented by G1, G2 and G3 respectively. The estimates associated with deposits yet to be discovered (prospective projects) and the remaining products not developed from prospective projects are categorized as G4 (Table 1).

25. In GB/T 19492-2020, a reservoir is generally a basic assessment unit. Based on the overall geological confidence of the reservoir, its geological reserves are assigned an independent category from Possible PIIP, Probable PIIP or Proved PIIP and associated with TRR and CRR accordingly. Proved includes Proved PIIP, Proved TRR, Proved CRR, Proved Remaining Developed CRR, Proved SCR and Proved UQ, all of which have a high level of confidence (G1). Probable includes Probable PIIP, Probable TRR, Probable CRR, Probable Remaining Developed CRR, Probable SCR and Probable UQ, all of which have a moderate level of confidence (G1+G2). Possible includes Possible PIIP, Possible TRR and Possible UQ, all of which have a low level of confidence (G1+G2+G3). For simplicity, unrecoverable quantities and sub-economic recoverable quantities have not been defined directly in GB/T 19492-2020. They can be derived from the defined terms (Table 2).

26. With regard to Prospective Projects, UNFC provides the option to Sub-categorize as G4.1, G4.2, and G4.3 based on the level of uncertainty, and under GB/T 19492-2020 these Categories refer to G4 without Sub-categorization. In practice, it reflects the best estimate.

Table 2
Mapping GB/T 19492-2020 to UNFC on the G Axis

GB/T 19492-2020 Classes and Categories					*UNFC Category*
Discovered	Proved PIIP	Proved TRR	Proved CRR	Production	
				Proved Remaining CRR	G1
			Proved SCR		
		Proved UQ			
	Probable PIIP	Probable TRR	Probable CRR	Production	
				Probable Remaining CRR	G1+G2
			Probable SCR		
		Probable UQ			
	Possible PIIP	Possible TRR			G1+G2+G3
		Possible UQ			
Undiscovered	Resources	Recoverable Resources			G4
		Undiscovered UQ			

B. E and F Axes

27. While the G Axis expresses the uncertainty and confidence levels within each reservoir, the detailed matrix used for the mapping on the E axis and the F axis can be seen in Figure III. This concerns project maturity. As shown in Figure III, some projects categorized as E2, E3.2 or E3.3 may meet F1.3, F1.2 or even F1.1 requirements. This will be unusual, especially for E3.2 or E3.3 projects and so this combination of E and F Categories should be used with care.

Figure III
Mapping on the E-F Matrix

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

Figure III *(continued)*
Mapping on the E-F Matrix

Classes	*Sub-classes*	*Code*	*GB/T 19492-2020 Classes/Categories*
Viable Projects	On Production	1	Proved Remaining Developed CRR
	Approved for Development	2	Proved Undeveloped CRR
	Justified for Development	3	Proved Undeveloped CRR
Potentially Viable Projects	Development Pending	4	Proved SCR, Probable Remaining CRR, Probable SCR, Possible TRR
	Development on Hold	5	Proved SCR, Probable Remaining CRR, Probable SCR, Possible TRR
Non-Viable Projects	Development Unclarified	6	Probable SCR, Possible TRR
	Development Not Viable	7	Probable SCR, Possible TRR
Remaining products not developed from identified projects		9	Proved, Probable and Possible UQs
Prospective Projects	No Sub-classes defined	8	Recoverable Resources
Remaining products not developed from prospective projects		9	Undiscovered UQ
Production which is unused or consumed in operations		10	Not defined

28. The simplified table is shown in Figure IV. Note that the E and F Categories set the "minimum" standards for UNFC classes. For example, a Potentially Viable Project must be at least E2 and F2, but it could also be E2F1 or E1F2. When mapping to E-Axis Categories, the social and environmental viability needs to be checked to ensure the project is mapped to the appropriate Category.

Figure IV
Mapping Classes and Categories between GB/T 19492-2020 and UNFC

GB/T 19492-2020 Categories / Classes		*UNFC "Minimum" Categories*			*UNFC Classes*
Discovered	Proved Remaining CRR	E1	F1	G1	Viable Projects
	Proved SCR	E2	F2	G1	Potentially Viable Projects
	Probable Remaining CRR, Probable SCR			G1+G2	
	Possible TRR			G1+G2+G3	
	Proved SCR	E3	F2	G1	Non-Viable Projects
	Probable SCR			G1+G2	
	Possible TRR			G1+G2+G3	
	Proved UQ	E3	F4	G1	Remaining products not developed from identified projects
	Probable UQ			G1+G2	
	Possible UQ			G1+G2+G3	
Undiscovered	Recoverable Resources	E3	F3	G4	Prospective Projects
	Undiscovered UQ	E3	F4	G4	Remaining products not developed from prospective projects

1. Prospective Projects

29. In Figure III, cells with the code number of 8 and 9 in the E-F matrix map, respectively, to Undiscovered Recoverable Resources and Undiscovered UQ (unrecoverable quantity) in GB/T 19492-2020. In UNFC, the G4 Category is used for Prospective Projects. While UNFC provides the option to expand G4 to account for different levels of uncertainty in recoverable quantities (G4.1, G4.2 and G4.3), GB/T 19492-2020 does not provide an uncertainty range and only the best estimate is provided.

2. Remaining Products Not Developed

30. GB/T 19492-2020 does not define technical un-recoverable quantities for any classes. They may be derived from the defined terms based on mass balance. In UNFC, these volumes are assigned as E3.3F4.

V. Mapping GB/T 19492-2020 Categories to UNFC Sub-categories

31. As UNFC contains more granularity than GB/T 19492-2020, it is expected that there will be instances where a single GB/T 19492-2020 Category could reflect a combination of several UNFC Sub-categories or Sub-classes.

32. UNFC is based on three axes (E, F and G) and allows each project to be classified according to the relevant maturity. GB/T 19492-2020 does not provide a full definition of classes according to a project's maturity. However, the division of Classes and Categories is based on the same principles: the levels of geological uncertainty and project status (E and F Axes) are closely linked and are expressed on the vertical axis of Figure I. Economic evaluations are included in the horizontal axis of Figure I, and mapped to the E Axis. Therefore, it is possible to establish a relationship between GB/T 19492-2020 Categories and UNFC Classes and Sub-classes (Figure III).

33. In UNFC, four classes are used for "known sources": "Viable Projects", "Potentially Viable Projects", "Non-Viable Projects" and "Remaining Products not developed from identified projects".

A. Viable Projects

34. The Remaining Proved Developed CRR and Proved Undeveloped CRR in GB/T 19492-2020 map to the "Viable Projects" class in UNFC. The development projects associated with the two classes of recoverable reserves are based on the approved, or economically justified, development plans. These quantities are Sub-categorized as E1.1 in UNFC.

35. The Remaining Proved Developed CRR maps directly to the UNFC sub-class "On Production" (F1.1). The Proved Undeveloped CRR, with its development plan approved, maps to the UNFC Sub-class "Approved for Development" (F1.2). The "Approved for Development" project requires that the capital funds have been committed and the development project is underway or due to start imminently.

36. Proved Undeveloped CRR for which the development feasibility study has been conducted but the development plan has not been approved corresponds to the UNFC Sub-class "Justified for Development" (F1.3). The "Justified for Development" project requires that a sufficiently detailed study has been conducted and the project has been demonstrated to be technically feasible and environmental-socio-economically viable and there must be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming.

37. Quantities for which extraction and sales become non-profitable on the basis of current market conditions and realistic assumptions of future market conditions, but are made viable economically through government subsidies and/or other considerations, are categorized as E1.2 in UNFC. These quantities may also be included in the Remaining Proved Developed CRR and/or Proved Undeveloped CRR under GB/T 19492-2020, and map to E1.2 in UNFC.

B. Potentially Viable Projects and Non-Viable Projects

38. The Proved SCR, Probable Remaining CRR, Probable SCR and Possible TRR in GB/T 19492-2020 correspond to the UNFC class "Potentially Viable Projects". These four classes of recoverable reserves are reasonably expected to become commercially recoverable through oil price rise or change of other economic parameters, technical advancement or improvement of other conditions, thus they can be assigned to E1 (if the issues are technical rather than environmental/socio-economic) or E2 in UNFC.

39. In GB/T 19492-2020, Proved SCR, Probable SCR and Possible TRR may be classified as "Non-Viable projects" in UNFC. They are Category E3 in UNFC. In due time, the economic condition may be updated based on new information. UNFC Categories will include either: reasonable prospects for commercial extraction and sale in the foreseeable future (E2), economic viability cannot be determined due to insufficient information (E3.2), or it is currently considered that there are no reasonable prospects in a foreseeable future for economic extraction and sale (E3.3), on the basis of realistic assumptions of future market conditions.

40. With regard to technical project maturity, the options are: either project activities are ongoing to justify development in the foreseeable future (F2.1); or project activities are on hold (F2.2); or there are no current plans to develop or acquire additional data due to limited potential (F2.3).

41. Mapping to the UNFC Categories and Sub-categories is based on the following principles:

- Development Pending projects must, as a minimum, satisfy the definitions of both F2.1 and E2. A project that meets all technical requirements, then it would be F1.3 if approvals/contracts have not yet been issued, but there are reasonable prospects in the foreseeable future. If Project activities are still ongoing to justify development in the foreseeable future, it would be F2.1, and if there is evidence to support the environmental-socio-economic viability, then it may satisfy the definition of E1.1

- Development on Hold projects are similar to Development Pending projects, but their progress in commerciality is constrained by activities which may be controlled by or outside the control of the evaluator. Projects on Hold are categorized as F2.2 to reflect the chance of commerciality but taking into account the current lack of progress in activities
- Development Unclarified projects are those where there is currently an insufficient basis for concluding that there are reasonable prospects for eventual economic extraction. This is generally caused by lack of data for making an assessment, or by evaluation being at an early stage. The projects are Sub-categorized as E3.2 and as F1.3, F2.1 or F2.2 based on the level of technical maturity
- Development Not Viable projects are potentially technically feasible projects (based on existing technology or technology currently under development), but they have been assessed as being of insufficient potential to warrant any further data acquisition activities or any direct efforts for eliminating commercial contingencies at the moment. In such cases, it can be helpful to identify and record these quantities as part of a portfolio so that in the event of a major change in commercial conditions it is possible to re-evaluate their potential for commercial development. These projects are considered to have insufficient potential for possible commercial development in the foreseeable future, and are therefore always referred to as the E3.3 Sub-category in UNFC. Typically, these projects will not be technically mature due to the lack of potential and can be Sub-categorized as F2.3. However, there could be circumstances where, for example, the project has been matured to F1.3 and then commercial circumstances have changed significantly.

42. The Probable Remaining CRR and Possible TRR in GB/T 19492-2020, for which the reservoir appraisal is underway and the commercial conditions are clarified, can be mapped to E1.1F2.1, and the Probable SCR associated with Probable CRR is mapped to E2F2.1 or E3F2.1. For a project that is uneconomic currently due to uncontrollable factors, such as a drop in oil and gas prices, Proved SCR can be mapped to E2F1.1 if the production of reservoir has started, or to E2F1.2 if the development plan for the project has been approved or is being implemented. The Proved SCR estimated is mapped to E2F1.3 if the development plan for the project has not been approved.

43. In the case where there are reasonable prospects for economic extraction and sale in the foreseeable future (E2), but project implementation is on hold, the Proved SCR that is estimated from the completion of Appraisal phase, and the Probable Remaining CRR, Probable SCR and Possible TRR that are estimated during Exploration phase are mapped to E2F2.2 “Development On Hold” in UNFC.

44. The Proved SCR and Probable SCR that are lower than the threshold of marginal economics, and the Possible TRR with its economics to be determined in GB/T 19492-2020, are mapped to sub-classes of the UNFC “Non-Viable projects”. In the case where the economic viability of their extraction cannot be determined due to insufficient information (sub-category E3.2), these categories of reserves should be mapped to the sub-class of “Development Unclarified”. They can be mapped to one of the Categories F1.3, F2.1 and F2.2 in UNFC. The Proved SCR, for which the reservoir appraisal is completed and it is technically feasible, is mapped to F1.3. The Probable SCR and Possible TRR, for which plans are available for new data acquisition, are mapped to F2.1; if the appraisal is delayed, both Categories are mapped to F2.2. If it is considered, based on realistic assumptions of future market conditions, that there are no reasonable prospects for economic extraction of reserves of these Categories in the foreseeable future (Sub-category E3.3), these categories of reserves are mapped to Sub-class “Development Not Viable”.

45. In the E-F matrix, E3.1 represents the production which is unused or consumed in operations, and is coded as 10. This volume is not defined in GB/T 19492-2020 but is included in CRR.

VI. Mapping GB/T 19492-2020 E&D Phases to UNFC Classes

46. In GB/T 19492-2020, the classification is mainly associated with geological confidence related to the exploration and development phases, rather than directly to project maturity. To some extent, this classification in GB/T 19492-2020 is in line with the project classification in UNFC, with the mapping relationship as shown in Figure V.

Figure V
Mapping of GB/T 19492-2020 E&D Phases to UNFC Classes

<table>
<tr><td colspan="3">GB/T 19492-2020</td><td colspan="2">UNFC</td></tr>
<tr><td colspan="3">Class and E&D Phases/Projects</td><td>Classes</td><td>Sub-classes</td></tr>
<tr><td rowspan="6">Discovered</td><td>Proved (Developed)</td><td rowspan="3">Development Phase
(Enhanced Recovery Projects and Development Construction Projects</td><td rowspan="3">Viable Projects</td><td>On Production</td></tr>
<tr><td rowspan="2">Proved (Undeveloped)</td><td>Approved for Development</td></tr>
<tr><td>Appraisal Phase
(Reservoir Appraisal Projects)</td><td>Justified for Development</td></tr>
<tr><td rowspan="2">Probable</td><td rowspan="4">Exploration Phase
(Exploration Risk and Exploration Projects)</td><td rowspan="2">Potentially Viable Projects</td><td>Development Pending</td></tr>
<tr><td>Development On Hold</td></tr>
<tr><td rowspan="2">Possible</td><td rowspan="2">Non-Viable Projects</td><td>Development Unclarified</td></tr>
<tr><td>Development Not Viable</td></tr>
<tr><td>Undiscovered</td><td>Resources</td><td>Prospective Projects</td><td>Not defined</td></tr>
</table>

47. In GB/T 19492-2020, along the Exploration and Development process, the project maturity is increased and the certainty of resources and reserves estimates are improved as well. In practice, the Exploration Phase in GB/T 19492-2020 is associated with the exploration risk and the exploration projects, the Appraisal Phase is associated with the reservoir appraisal projects, and the Development Phase is associated with the development construction and Enhanced Oil Recovery projects, which corresponds to UNFC's Classes and Sub-classes to a certain extent.

48. The appraisal projects, development construction projects and enhanced recovery projects are mapped to the "Viable projects" in UNFC. The enhanced recovery projects include infill wells, water (steam) injection, gas injection and polymer injection, so they are mapped to the sub-class of "On Production" in UNFC. The development construction projects, for which the development plan has been approved and/or the production capacity is in construction, are mapped to the sub-class of "Approved for Development" in UNFC. The final results of reservoir appraisal projects are the Proved Undeveloped CRR which corresponds to the completion of preparing the development plan. These projects are mapped to the sub-class of "Justified for Development" in UNFC.

49. Exploration projects may achieve Probable PIIP, Possible PIIP or Undiscovered PIIP, mapping to the "Potentially Viable projects", "Non-Viable projects" and/or "Prospective Projects" in UNFC. The exploration risk projects map to the Prospective Projects.

VII. Undefined and Unclassified Quantities in GB/T 19492-2020

50. As noted above, UNFC specifies that all non-sales quantities (lease fuel, flare and losses) may be separately identified and documented in addition to sales quantities. When it

is necessary to differentiate lease fuel and flare and losses within UNFC, quantities of each non-sales type should be accounted as a different product type (see UNFC Generic Specification D) and reported separately. Unused production and Consumed in operations are not defined directly in GB/T 19492-2020.