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Generic specifications for the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009

Draft Bridging Document between "Classification for Resources/Reserves on Petroleum Commodities" (GB/T 19492-2004) and "United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009"

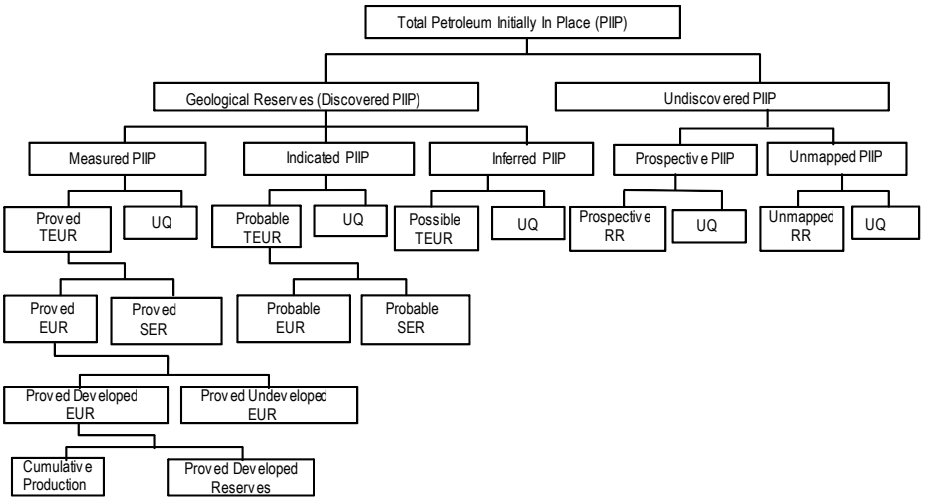
DRAFT FOR DISCUSSION

I. Foreword

1. Bridging Documents explain the relationship between the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) and another classification system that has been endorsed by the Expert Group on Resource Classification (EGRC) as an Aligned System. They incorporate instructions and guidelines on how to classify estimates generated by application of that Aligned System using the UNFC-2009 Numerical Codes. The relevant Bridging Document shall be identified when reporting estimates using the UNFC-2009 Numerical Codes.

2. The China Classification for Petroleum Reserves and Resources 2004 (CCPR-2004) refers to the classification for petroleum reserves and resources 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 April 30, 2004, and implemented on October 1, 2004. It establishes unified guidance regarding the China principles for calculation, review and reporting of reserves and resources of crude oil, natural gas (including free gas, gas from cap gas, and gas dissolved in oil) and gas condensate (Figure 1).

Figure 1
China Classification for Petroleum Reserves and Resources 2004



Note: (1) PIIP is an abbreviation of Petroleum Initially In Place, TEUR is an abbreviation of Technically Estimated Ultimate Recovery, UQ is an abbreviation of Unrecoverable Quantities, and RR is an abbreviation of Recoverable Resources. EUR, an abbreviation of Estimated Ultimate Recovery, refers to those quantities of petroleum which are estimated, on a given date, to be potentially recoverable from an accumulation, plus those quantities already produced therefrom. SER, an abbreviation of Sub-Economic Recovery, refers to the technically estimated ultimate recovery that is determined sub-economic in economic evaluation, or cannot be classified as EUR with consideration to contract, enhanced recovery technology or other factors.

(2) In the CCPR-2004, “Measured” “Indicated” and “Inferred” are categories of PIIP within a reservoir based on geological confidence. “Proved”, “Probable” and “Possible” refer to the recoverable portions of Measured, Indicated and Inferred respectively.

3. This document compares reserves and resources by categories of CCPR-2004 to Categories and Classes of UNFC-2009.

4. CCPR-2004 is independent from UNFC-2009 and is mandatory for reporting to the Ministry of Land and Resources of PRC. This Bridging Document has no bearing on the mandatory reporting requirements or on the independent application of CCPR-2004.

II. Definition of terms of resources/reserves and basic principles for identifying reserves and resource categories in CCPR-2004

5. In CCPR-2004, the classification of petroleum reserves and resources is mainly based on exploration and development phases, geological knowledge and productivity confirmation. They can be divided into two major classes: Reserves and Resources , according to the status of discovery of petroleum reservoirs. By the exploration and development phases and geological reliability, Reserves is divided into three categories, i.e. Measured, Indicated, and Inferred; Resources is divided into two categories, i.e. Prospective and Unmapped. These categories are subdivided by technical recoverability,

economic viability, and development status (see Paragraphs 16-29 for details). By technical recoverability, PIIP of each category is subdivided into TEUR and UQ. By economic viability, TEUR is subdivided into EUR and SER, which only involve “Proved” and “Probable” categories. The EUR refers to the economically recoverable initial quantities. The SER is the TEUR minus the EUR. The Proved Developed Reserves is the EUR minus the Cumulative Production.

6. In CCPR-2004, the classification focuses more on geological knowledge and technical recoverability than economic viability. As the type of project is related to the exploration and development phases, the classification and categorization of Geological Reserves and TEUR are highly valued.

7. CCPR-2004 emphasizes the overall assessment of petroleum reservoirs. Depending on the level of geologic uncertainty of the petroleum reservoir, reserves that relate to the reservoir is assigned to one of three categories, i.e., measured, indicated, and inferred, which reflect three levels of geologic confidence, i.e., high, moderate and low, respectively.

8. Total Petroleum Initially In Place (PIIP): refers to the total oil and gas quantities existing initially in known and unknown accumulations which are estimated by using appropriate method, based on the geological, geophysical and laboratory data provided in different exploration and development phases.

9. Geological Reserves (Discovered PIIP): 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 is found by drilling. It can be categorized as Measured PIIP, Indicated PIIP and Inferred PIIP.

10. Measured PIIP: refers to the Geological Reserves that are estimated with a high level of confidence and relative error not more than ±20% after the reservoirs/fields have been proved economically recoverable by appraisal drilling during the Reservoir Appraisal phase. The Measured PIIP is estimated under the preconditions that: (1) the reservoir type, reservoir space type, drive mechanism, fluid properties and distributions, and productivities etc. are ascertained; (2) fluid contacts or the lowest known hydrocarbons are determined by drilling, logging and testing data or reliable pressure data; (3) reasonable well control or primary development well pattern designed in development plan are available; and (4) all parameters have a high level of certainty.

11. Indicated PIIP: refers to the Geological Reserves that are estimated with a moderate level of confidence and relative error not more than ±50% after commercial oil or gas flows are obtained from a wildcat during the General Exploration Phase. The Indicated PIIP is estimated under the preconditions that: (1) structural configuration, reservoir formation continuity, oil and gas distribution, reservoir type, fluid properties and productivities, etc. are preliminarily ascertained; (2) the level of geologic confidence is moderate; and (3) it can be used as evidence for drilling reservoir appraisal wells and making conceptual design or development plans.

12. Inferred PIIP: refers to the Geological Reserves that are estimated with a rather low level of confidence in the probably existing oil and/or gas reservoirs/fields with further exploration potential during the General Exploration Phase 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. The Inferred PIIP is estimated under the preconditions that: (1) the structural configurations and reservoir conditions should be preliminarily ascertained; and (2) a wildcat has obtained oil and/or gas flows or encountered oil and/or gas layers, or the reservoir/field is immediately adjacent to the Measured (or Indicated) zones and predicted with the presence of oil and/or gas layers, which reveals further exploration potential through comprehensive analysis.

13. Undiscovered PIIP: refers to the total quantities of oil and gas estimated in unknown accumulations based on prediction. It can be categorized as Prospective PIIP and Unmapped PIIP.

14. Prospective PIIP: refers to the Total Petroleum Initially in Place in known favorable traps or blocks/formations adjacent to oil and/or gas field estimated by the trap method at the early stage of the General Exploration Phase, through analysis and analogy of petroleum geological conditions.

15. Unmapped PIIP: refers to the Total Petroleum Initially In Place in the prospecting basin, depression, sag, belt and other accumulations, which is estimated in the Regional Reconnaissance phase or other exploration phases, based on geological, geophysical and geochemical reconnaissance, and regional exploratory well data. It is generally the Total Petroleum Initially In Place minus the Prospective PIIP and minus the Geological Reserves.

16. Recoverable Reserves: refers to the recoverable oil and/or gas quantities from the Geological Reserves by applying development programs. By the levels of geologic confidence and economic viabilities, it can be divided into seven types (as shown in Paragraphs 17-23. Note: The Inferred PIIP is intrinsic economic, and is not classified as EUR).

17. Proved TEUR: refers to the technically estimated ultimate recovery meeting the following requirements:

a) The technology (including oil and/or gas production technology and enhanced recovery technology) has been demonstrated by pilot project to be favorable for implementation, or the recovery technology has actually been used successfully in analogous reservoirs.

b) The conceptual design or development plan has been available, and the development has been implemented or will be implemented in the near future;

c) Based on recent average prices and costs, the feasibility study indicates that the development is economic or sub-economic.

18. Proved EUR: refers to the estimated ultimate recovery meeting the following requirements:

a) Based on the different requirements, the prices and costs are those on the as-of-date or stipulated in the contracts or agreements, and other related economic conditions;

b) The applicable technology has been implemented, or the applicable technology has been demonstrated by pilot project and is to be certainly implemented, or the applicable technology has been applied successfully in analogous reservoirs in the same field and is to be certainly implemented;

c) Development plan is available, and it will be carried out in the near future; for gas there should be an existing gas pipeline or gas pipeline construction agreement, and there should also be a sales contract or agreement;

d) 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;

e) The economic productivity is supported by either actual production or conclusive test, or the economic productivity in the objective formation is confirmed to be similar to the same formation in the wells located beyond direct offsets or the similar formation in the same well which has indicated economic production;

f) Feasibility studies show the development is economic;

g) There should be at least 80% probability that the quantities actually recovered in the future will equal or exceed the estimated EUR.

19. Proved SER: refers to the difference between the Proved TEUR and the Proved EUR, and includes two parts:

a) Those Proved TEUR for which the feasibility studies indicate the development is sub-economic;

b) Those Proved TEUR that is anticipated to be economic, but for which uncertainties in contractual and/or enhanced recovery technologies preclude such volumes being classified as Proved EUR.

20. Probable TEUR: refers to the technically estimated ultimate recovery meeting the following requirements:

a) The applicable technology is presumed to be probably implemented;

b) The feasibility studies show the development is above sub-economic.

21. Probable EUR: refers to the estimated ultimate recovery meeting the following requirements:

a) The feasibility studies show the development is economic;

b) There should be at least 50% probability that the quantities actually recovered in the future will equal or exceed the estimated EUR.

22. Probable SER: refers to the difference between the Probable TEUR and the Probable EUR.

23. Possible TEUR: refers to the technically estimated ultimate recovery meeting the following requirements:

a) The applicable technology is optimistically presumed to be implemented;

b) There should be at least 10% probability that the quantities actually recovered in the future will equal or exceed the estimated TEUR.

24. Recoverable Resources: refers to the recoverable oil and gas quantities from the PIIP. It can be categorized as Prospective RR and Unmapped RR, for which the recovery factors are estimated by the empirical analogy method.

25. Prospective RR: refers to the recoverable oil and gas quantities from the Prospective PIIP.

26. Unmapped RR: refers to the recoverable oil and gas quantities from the Unmapped PIIP.

27. Proved Developed EUR: refers to the Recoverable Reserves that have been fully put into production after the completion of well drilling in a pattern designed in the oil and/or gas reservoir development plan and the installment of associated facilities. When the facilities required for the enhanced recovery technology (e.g. water flooding) have been completed and put into services, the accordingly increased recoverable reserves are also categorized as Proved Developed EUR. The Proved Developed EUR can be used in production analysis, adjustment and management, and can also be used as a measurement for accuracy comparison of different levels of recoverable reserves. The Proved Developed EUR should be updated regularly during the development and production. The Proved Developed EUR after subtracting Cumulative Production is the Proved Developed Reserves.

28. Proved Undeveloped EUR: refers to the estimated ultimate recovery in the oil and/or gas reservoirs/fields where the appraisal drilling has been completed or a production pilot has been conducted, but the production well pattern has not been deployed yet.

29. Unrecoverable Quantities (UQ): refers to the difference between the PIIP and the Recoverable Quantities (RQ). In CCPR-2004, the UQ can be divided into five categories, corresponding to the Unmapped, Prospective, Inferred, Indicated and Measured categories respectively.

30. To estimate the Recoverable Reserves by CCPR-2004, TEUR is firstly calculated, and then economic evaluation is conducted with respect to Proved TEUR and Probable TEUR in order to distinguish EUR and SER. Economic evaluation is not made on Possible TEUR. Economic evaluation may demonstrate two cases as follows:

a) If the reservoir is ascertained with EUR, the SER equals to the TEUR minus the EUR; and

b) If the reservoir is not ascertained with EUR, the SER wholly equals to the TEUR.

When CCPR-2004 is bridged with UNFC-2009, in Case a), the Proved Developed Reserves, Proved Undeveloped EUR and Proved SER in CCPR-2004 are used for mapping, and the Probable EUR and Probable SER in CCPR-2004 are used for mapping; in Case b), or for the reservoirs/fields with their development on hold due to other reasons, the Proved SER and Probable SER in CCPR-2004 are used for mapping. In addition, the Possible TEUR in CCPR-2004 is used for mapping.

III. Direct mapping of categories and sub-categories

A. Application of the G-axis

31. In UNFC-2009, the in-place and recoverable quantities within known (discovered) deposits are categorized into high, moderate and low level of confidence, represented by G1, G2 and G3. The estimated quantities associated with deposits yet to be discovered (project in exploration stage) are categorized as G4.

32. In CCPR-2004, the Geological Reserves is mainly estimated by the volumetric method, with the reservoir as the basic unit. Reserves are divided into three categories, i.e. inferred, indicated and measured, in an ascending order of the overall status of reservoirs in the exploration and development phases and the geological knowledge. Each reservoir has an independent category of geological reserves. In CCPR-2004, the TEUR and EUR have mapping relationship with the Geological Reserves in respect of category. The Measured category includes Measured PIIP, Proved TEUR, Proved EUR and Proved SER, all of which have a high level of confidence (G1). The Indicated category includes Indicated PIIP, Probable TEUR, Probable EUR and Probable SER, all of which have a moderate level of confidence (G2). The Inferred category includes Inferred PIIP and Possible TEUR, all of which have a low level of confidence (G3). This aligns with the separate assessment by segment method as shown in Figure 2.

33. With regard to Exploration Projects, while UNFC-2009 provides the option to sub-categorize G4.1, G4.2, and G4.3 based on geological uncertainty, under CCPR-2004 these categories refer to G4 without sub-categorization; when used alone, it reflects the best estimate.

Figure 2
Comparison of CCPR-2004 and UNFC-2009 in geological knowledge

<table>
<tr><th colspan="6">CCPR-2004 Categories</th><th colspan="2">UNFC-2009 Category</th></tr>
<tr><td rowspan="6">Discovered</td><td rowspan="4">Measured</td><td rowspan="4">Geological Reserves</td><td rowspan="3">TEUR</td><td rowspan="2">EUR</td><td>Proved Developed Reserves</td><td rowspan="4">G1</td><td rowspan="4">Quantities associated with a known deposit that can be estimated with a high level of confidence</td></tr>
<tr><td>Proved Undeveloped Reserves</td></tr>
<tr><td colspan="2">SER</td></tr>
<tr><td colspan="3">UQ</td></tr>
<tr><td rowspan="3">Indicated</td><td rowspan="3">Geological Reserves</td><td rowspan="2">TEUR</td><td colspan="2">EUR</td><td rowspan="3">G2</td><td rowspan="3">Quantities associated with a known deposit that can be estimated with a moderate level of confidence</td></tr>
<tr><td colspan="2">SER</td></tr>
<tr><td colspan="3">UQ</td></tr>
<tr><td rowspan="2">Inferred</td><td rowspan="2">Geological Reserves</td><td colspan="3">TEUR</td><td rowspan="2">G3</td><td rowspan="2">Quantities associated with a known deposit that can be estimated with a low level of confidence</td></tr>
<tr><td colspan="3">UQ</td></tr>
<tr><td rowspan="4">Undiscovered</td><td rowspan="2">Prospective</td><td rowspan="2">PIIP</td><td colspan="3">RR</td><td rowspan="4">G4</td><td rowspan="4">Estimated quantities associated with a potential deposit, based primarily on indirect evidence</td></tr>
<tr><td colspan="3">UQ</td></tr>
<tr><td rowspan="2">Unmapped</td><td rowspan="2">PIIP</td><td colspan="3">RR</td></tr>
<tr><td colspan="3">UQ</td></tr>
</table>

B. Detailed mapping of the E and F axes

34. While the G-axis defines the confidence levels within each project, the allocation to UNFC-2009 Classes and Sub-classes is based on a matrix formed from the E-axis (Economic and Social viability of project) and the F-axis (Field Project Status and its Feasibility). Figure 3 shows mapping not including optional sub-classes. Figure 4 shows mapping of the E-F Sub-category matrix to the CCPR-2004 categories with colour coded and numeric keys. Note that the E and F Categories set the "minimum" standards for UNFC-2009 classes. For example, a Potentially Commercial Project must be at least E2 and F2, but it could also be E2F1.

Figure 3
Mapping of CCPR-2004 and UNFC-2009 classes and categories

(See Paragraph 34 for the explanation of “minimum”)

CCPR-2004 Categories / Classes		UNFC-2009 "minimum" Categories			UNFC-2009 Classes
Discovered	Proved Developed Reserves, Proved Undeveloped EUR	E1	F1	G1	Commercial Projects
	Proved SER, Probable EUR, Probable SER， Possible TEUR	E2	F2	G1, G2, G3	Potentially Commercial Projects
	Probable SER, Possible TEUR	E3	F2	G2, G3	Non-Commercial Projects
	UQ (Measured, Indicated and Inferred)	E3	F4	G1, G2, G3	Additional Quantities in Place
Undiscovered	Prospective RR, Unmapped RR	E3	F3	G4	Exploration Projects
	UQ (Prospective, Unmapped)	E3	F4	G4	Additional Quantities in Place

35. Within each UNFC-2009 Class or Sub-class there is a range of uncertainty with regard to the quantities in place and recoverable quantities ranging from high confidence (G1) to low confidence (G3).

36. As shown in Figure 4, there are many blank cells in the E-F matrix, indicating that the type corresponding to the cell is less in CCPR-2004 and thus labeled as Less Common Mapping. In many cases, the CCPR-2004 categories map to more than one location in the E-F matrix. Section IV of this Bridging Document describes how CCPR-2004 categories shall be assigned to the correct sub-classes of UNFC-2009.

Figure 4
Mapping of the E-F Matrix to CCPR-2004 classes and categories with a Colour Coded and Numeric Key

	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	12	12	12	12	12	12				
E3.2			6	6	6		8	9	10	
E3.3			7	7	7	7				11

Class	Sub-class	Code	CCPR-2004 Classes and Categories
Commercial Projects	On Production	1	Proved Developed Reserves
	Approved for Development	2	Proved Undeveloped EUR
	Justified for Development	3	Proved Undeveloped EUR
Potentially Commercial Projects	Development Pending	4	Proved SER, Probable EUR, Probable SER , Possible TEUR
	Development on Hold	5	Proved SER, Probable EUR, Probable SER , Possible TEUR
Non-Commercial Projects	Development Unclarified	6	Probable SER, Possible TEUR
	Development Not Viable	7	Probable SER, Possible TEUR
Additional Quantities in Place		11	Measured, Indicated and Inferred UQs
Exploration Projects	Prospect	8	Prospective RR
	Lead	9	
	Play	10	Unmapped RR
Additional Quantities in Place		11	Prospective and Unmapped UQs
Produced Not Sold		12	

Note that Code 12 refers to quantities typically referred to as “fuel, flare and losses”. Fuel is that portion of production consumed in operations and thus not delivered to the sales reference point.

C. Exploration projects

37. There are four cells (8, 9, 10 and 11) with the E-F matrix that map to CCPR-2004 categories of undiscovered quantities associated with exploration projects at different stages of maturity. In UNFC-2009, the E3.2 and G4 categories are used for the classification of Exploration Projects. While UNFC-2009 provides the option to expand G4 to account for uncertainty (G4.1, G4.2 and G4.3) in recoverable quantities, CCPR-2004 does not provide an uncertainty range. G4 when used alone shall reflect the best estimate.

D. Additional Quantities in Place

38. Additional Quantities in Place under UNFC-2009 correspond to quantities of hydrocarbons that are currently assessed as technically non-recoverable for any classes. In UNFC-2009 the E3.3 and F4 categories are used for classification of Additional Quantities in Place. Within UNFC-2009, the geologic uncertainty for undiscovered quantities is described using Category G4. While UNFC-2009 provides the option to expand G4 to account for uncertainty (G4.1, G4.2 and G4.3) in additional in-place quantities, CCPR-2004 does not provide an uncertainty range. G4 when used alone shall reflect the best estimate.

IV. Sub-division of CCPR-2004 categories into multiple UNFC-2009 sub-categories

39. As UNFC-2009 contains more granularity than CCPR-2004, it is expected that there will be many instances where a single CCPR-2004 category could reflect a combination of several UNFC-2009 sub-categories. This is illustrated in Figure 4. The criteria to be used to subdivide CCPR-2004 categories and utilize the full range of UNFC-2009 sub-categories are described in sections IV.A, IV.B and IV.C.

40. UNFC-2009, which is based on three axes (E, F and G), allows the defining of classes and sub-classes according to a project's maturity level for each type of project. CCPR-2004 does not provide the defining of sub-classes according to a project's maturity level, but the division of classes and categories is based on the same principles: levels of geologic uncertainty (G axis), project status (F axis) and economic evaluation (E axis), therefore it is possible to establish an interrelationship between CCPR-2004 classes and categories and UNFC-2009 classes and sub-classes (Figure 4).

41. In UNFC-2009, four classes are used for "known deposits": "Commercial Projects" "Potentially Commercial Projects" "Non-Commercial Projects" and "Additional Quantities in Place". Previously extracted sales production quantities are not included in Figure 4, while non-sales production quantities are shown in Figure 4 and referred to as Code 12.

A. Commercial projects sub-categorization

42. The Proved Developed Reserves and Proved Undeveloped EUR in CCPR-2004 map to the "Commercial projects" class in UNFC-2009. Because the development projects to which the two classes of recoverable reserves correspond are carried out in accordance with the approved or economically justified development plans, these quantities are sub-categorized as E1.1 in UNFC-2009.

43. Proved Developed Reserves maps directly to the UNFC-2009 sub-class "On Production" (F1.1). The Proved Undeveloped EUR with its development plan approved maps to the UNFC-2009 sub-class "Approved for Development" (F1.2). The "Approved for Development" project requires that the capital funds have been committee and the development project is being underway.

44. Proved Undeveloped EUR for which the development feasibility study has been conducted but the development plan has not been approved corresponds to the UNFC-2009 sub-class "Justified for Development" (F1.3). The "Justified for Development" project requires that sufficient detailed study has been conducted and the implementation of development project demonstrates the feasibility of development. The project has been demonstrated to be technically feasible and there must be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming. Meanwhile, when the Proved Undeveloped EUR turns to the Proved Developed Reserves, the project can be authorized to put into production.

45. 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-2009. Similarly, the Proved Developed Reserves and Proved Undeveloped EUR map to E1.2. The Proved SER in CCPR-2004 that is associated with E1.1 and E1.2 and lower than the economic threshold maps to the "Potentially Commercial Projects" in UNFC-2009.

46. Associated quantities derived from Proved Developed Reserves, Proved Undeveloped EUR, Proved SER, Probable EUR, Probable SER, and Possible TEUR, that are forecast to be extracted, but will not be available for sale, refer to Sub-category E3.1 in UNFC-2009. The project sub-category (F axis) will be the same as for associated quantities being extracted and sold. The level of geologic uncertainty is also reflected in the project uncertainty.

B. Potentially commercial and non-commercial projects sub-categorization

47. The Proved SER, Probable EUR, Probable SER and Possible TEUR in CCPR-2004 correspond to the UNFC-2009 sub-class "Potentially Commercial 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 and E2 in UNFC-2009. They mainly involve the following three types of projects:

a) Projects that are demonstrated by the development feasibility study to contain Proved SER associated with Proved EUR, upon the completion of Reservoir Appraisal phase;

b) Projects that are demonstrated by the preliminary development feasibility study to contain Probable EUR and Probable SER above the threshold of marginal economics, during the reservoir appraisal exploration;

c) Projects that contain Possible TEUR with the potential of upgrading ascertained and the activities of evaluation for upgrading in progress, after the oil and gas reservoir is discovered.

48. The Possible TEUR and Probable SER in CCPR2004, which may be generated successively from the discovery of reservoir to the completion of reservoir appraisal, may be classified as non-commercial in UNFC-2009. These classes of recoverable reserves, for which the appraisal is still at the early stage, or in the foreseeable future, its development is expected to be non-commercial, are referred to as Sub-category E3 in UNFC-2009.

49. With regard to economics, there can be either reasonable prospects for economic 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.

50. With regard to project maturity, there are either project activities 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).

51. Mapping to the UNFC-2009 Categories and Sub-categories shall be based on the following principles:

(i) Development Pending project must, as a minimum, satisfy the definitions of both F2.1 and E2. A project that meets all technical requirements but does not meet the current economic threshold (no approved Development Plan) is referred to as F1.3. A project with unresolved technical feasibility issues is referred to as F2.1, but if there are no doubts about commercial viability, it could satisfy the definition of E1.1. Sub-category E1.2 cannot usually be associated with a project classified as Development Pending. The reason for this is that there should be no doubts about commercial viability (as mentioned in the

preceding paragraph) and this is unlikely to be the case at that moment (when the project is still under evaluation) if a subsidy is required.

(ii) Projects On Hold 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 classified as E2F2.2 to reflect the chance of commerciality but taking into account the current lack of activity progress

(iii) 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. A project that meets all the technical requirements but does not meet current commercial thresholds is sub-categorized as F1.3. A project with unresolved technical and commercial issues is sub-categorized as F2.1. If activities are on hold, or evaluation is still to be completed, the project is sub-categorized as F2.2.

(iv) Development Not Viable projects are 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-2009. Typically, these projects will not be technically mature due to the lack of potential and can be subcategorized as F2.3. However, there can be circumstances where, for example, the project has been improved to F1.3 and the commercial circumstances changed significantly.

52. Consequently, as to the UNFC-2009 sub-class “Development Pending”, the Probable EUR and Possible TEUR in CCPR-2004 for which the reservoir appraisal is underway and the economics are clarified are mapped to E1.1F2.1, and the Probable SER associated with Probable EUR is mapped to E2F2.1. For a project that is uneconomic currently due to uncontrollable factors, such as drop of oil and gas prices, the Proved SER estimated is 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 implemented. The Proved SER estimated is mapped to E2F1.3 if the development plan for the project has not been approved.

53. 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 SER that is estimated from the completion of Reservoir Appraisal phase to the Production Operation phase, and the Probable EUR, Probable SER and Possible TEUR that are estimated during the reservoir appraisal activities are mapped to E2F2.2 “Development on Hold” in UNFC-2009.

54. The Proved SER and Probable SER that are lower than the threshold of marginal economics and the Possible TEUR with its economics to be determined in CCPR-2004 are mapped to both sub-classes of the UNFC-2009 Class “Non-commercial Projects”. In the case where economic viability of their extraction cannot be determined due to insufficient information (sub-category E3.2), these categories of reserves should map to sub-class “Development Unclarified”. They can be mapped to one of the categories F1.3, F2.1 and F2.2 in UNFC-2009. The Probable SER for which the reservoir appraisal is completed and proves that it is feasible technically is mapped to F1.3. The Probable SER and Possible

TEUR for which the plans of appraisal for upgrading and new data acquisition are available 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".

55. In the E-F matrix, E3.1 represents the non-sales production quantities and is expressed as a numeric symbol – 12. It is not defined in CCPR-2004 but included in the category of EUR. This is different from UNFC-2009 (see Paragraph 62 for details).

V. Mapping of the exploration and development phases in CCPR-2004 to the projects in UNFC-2009

56. It is noted that CCPR-2004 does not involve the projects but classifies five exploration and development phases. The phase classification in CCPR-2004 is comparative with the project classification in UNFC-2009 to some extent, with their mapping relationship as shown in Figure 5.

Figure 5
Mapping of the exploration and development phases in CCPR-2004 to the projects in UNFC-2009

<table>
<tr><th colspan="3">CCPR-2004
Reserves and Resources Classes and Classification of Phases/Projects</th><th>UNFC-2009
Classification of Projects</th><th>UNFC-2009
Classification of Sub-Projects</th></tr>
<tr><td rowspan="6">Discovered</td><td>Measured (developed)</td><td>Production Operation phase / enhanced recovery projects</td><td rowspan="4">Commercial Projects</td><td>On Production</td></tr>
<tr><td rowspan="2">Measured (undeveloped)</td><td>Development Construction phase / development construction projects</td><td>Approved for Development</td></tr>
<tr><td rowspan="3">Reservoir Appraisal phase / appraisal projects</td><td rowspan="2">Justified for Development</td></tr>
<tr><td rowspan="2">Indicated</td></tr>
<tr><td>Potentially Commercial Projects</td><td>Development Pending or On Hold</td></tr>
<tr><td>Inferred</td><td rowspan="3">General Exploration phase / general exploration projects</td><td rowspan="2">Non-Commercial Projects</td><td>Development Unclarified or Not Viable</td></tr>
<tr><td rowspan="3">Undiscovered</td><td rowspan="2">Prospective</td><td rowspan="3">Exploration Projects</td><td>Prospect</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Unmapped</td><td>Regional Reconnaissance phase / risk exploration projects</td><td>Play</td></tr>
</table>

57. Just as that the project maturity category in UNFC-2009 determines the commerciality of Recoverable Quantities, the classification of exploration and development phases in CCPR-2004 determines the classes of reserves and resources. As the exploration and development phases of projects arise, their commercial maturity increases, and the confidence level and commercial level of reserves and resources are also improved. Actually, in CCPR-2004, the Regional Reconnaissance phase is equivalent to risk exploration projects, the General Exploration phase to general exploration projects, the Reservoir Appraisal phase to reservoir appraisal projects, the Development Construction phase to development construction projects, and the Production Operation phase mainly to enhanced recovery projects; they have mapping relationship with the categories (projects) and sub-categories (sub-projects) in UNFC-2009.

58. The development construction projects and enhanced recovery projects are mapped to the “Commercial Projects” in UNFC-2009. Specifically, the enhanced recovery projects include infill well, water (steam) injection, gas injection and polymer injection, and they are mapped to the sub-projects “On Production” in UNFC-2009. The development construction projects are equivalent to the Proved Undeveloped reserves for which the development plan has been approved and/or the production capacity is in construction, and they are mapped to the sub-projects “Approved for Development” in UNFC-2009.

59. The reservoir appraisal projects are mainly mapped to the “Potentially Commercial Projects” in UNFC-2009. The resultant achievements of these projects are Measured (undeveloped) reserves and mapped to the sub-projects “Justified for Development” under the “Commercial Projects” in UNFC-2009. The Indicated reserves obtained from reservoir appraisal projects is mainly mapped to the sub-projects “Development Pending” or “On Hold” under “Potentially Commercial Projects” in UNFC-2009.

60. The general exploration projects are mapped to “Non-Commercial Projects” and “Exploration Projects” in UNFC-2009. The Inferred reserves and Prospective reserves are derived from these projects. The Inferred reserves is mapped to the sub-projects “Development Unclarified” or “Not Viable” under “Non-Commercial Projects” in UNFC-2009. The Prospective reserves is mapped to the sub-projects “Prospect” and “Lead” under the “Exploration Projects” in UNFC-2009.

61. The risk exploration projects are mapped to the sub-projects “Play” under the “Exploration Projects” in UNFC-2009. The Unmapped PIIP can be obtained from these projects.

VI. Undefined and unclassified quantities in CCPR-2004

62. As noted above, UNFC-2009 specifies that all non-sales quantities (lease fuel, flare and losses) may be separately identified and documented in addition to sales quantities. When needed to differentiate lease fuel and flare and losses within UNFC-2009, quantities of each non-sales type should be accounted as different product type (see UNFC-2009 Generic Specification D) and reported separately. Non-sales quantities are not defined and classified in CCPR-2004.