China Petroleum Resources Classification

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Outline

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- Reserve Classification System
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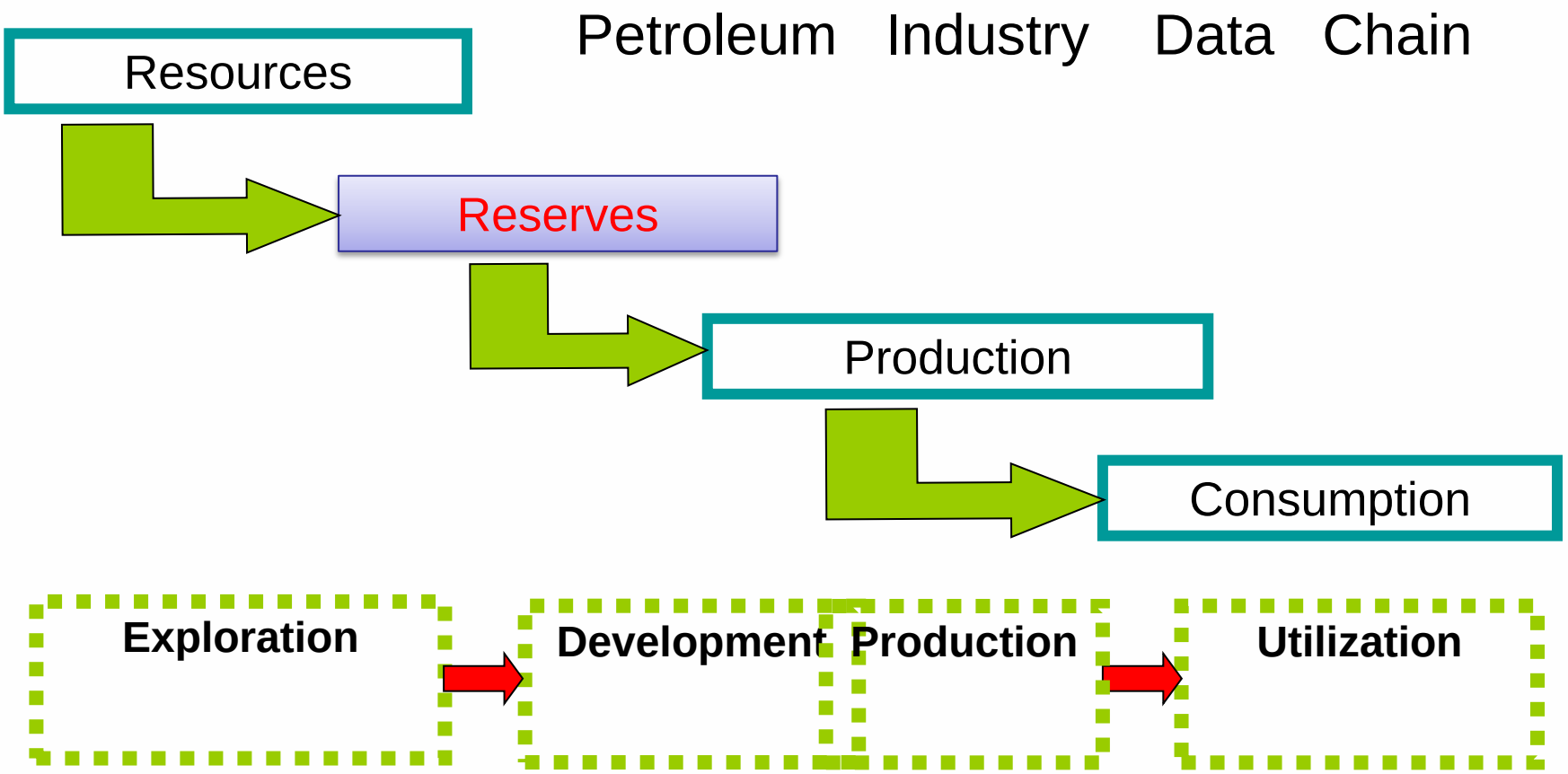
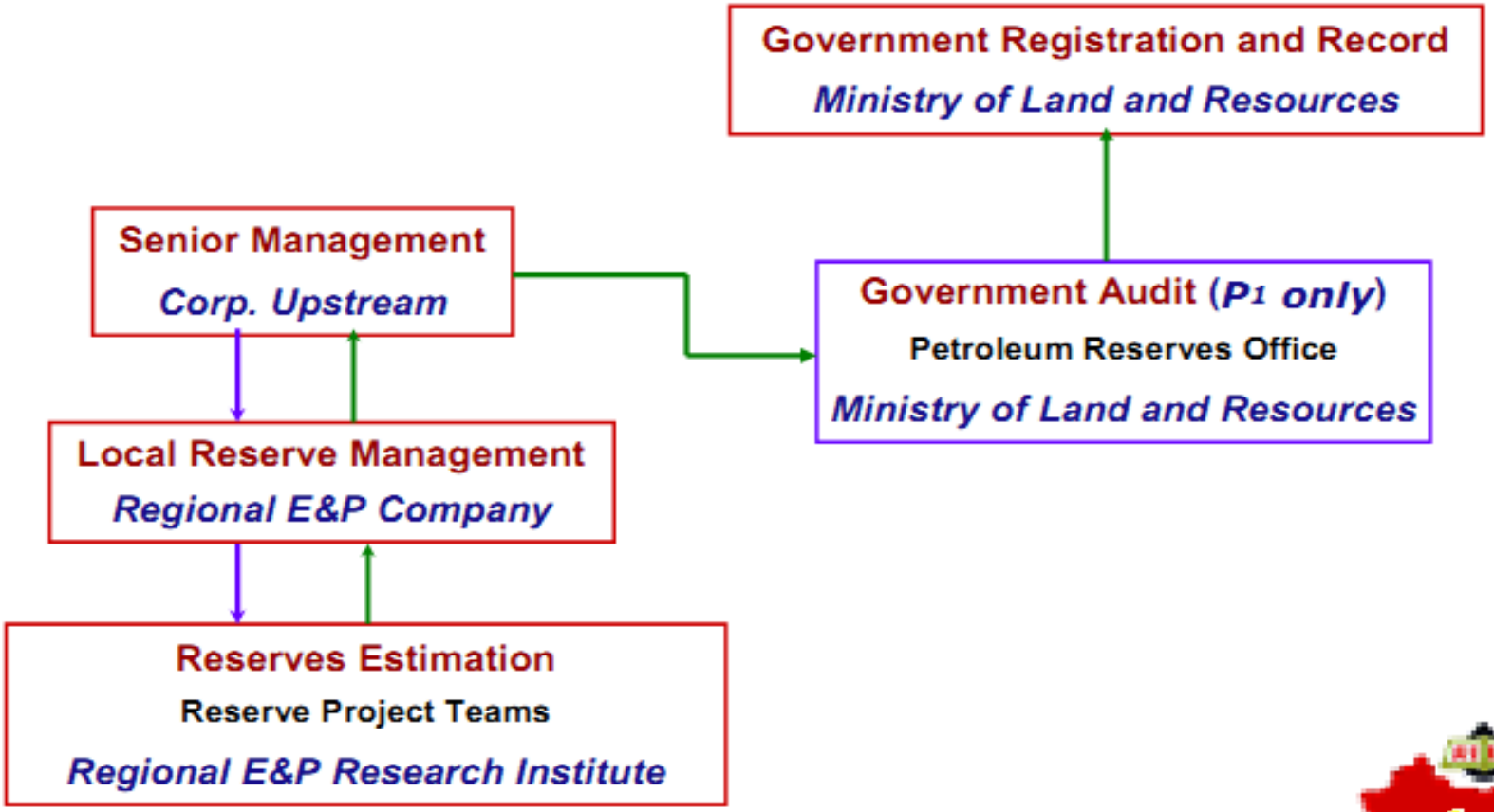
Background



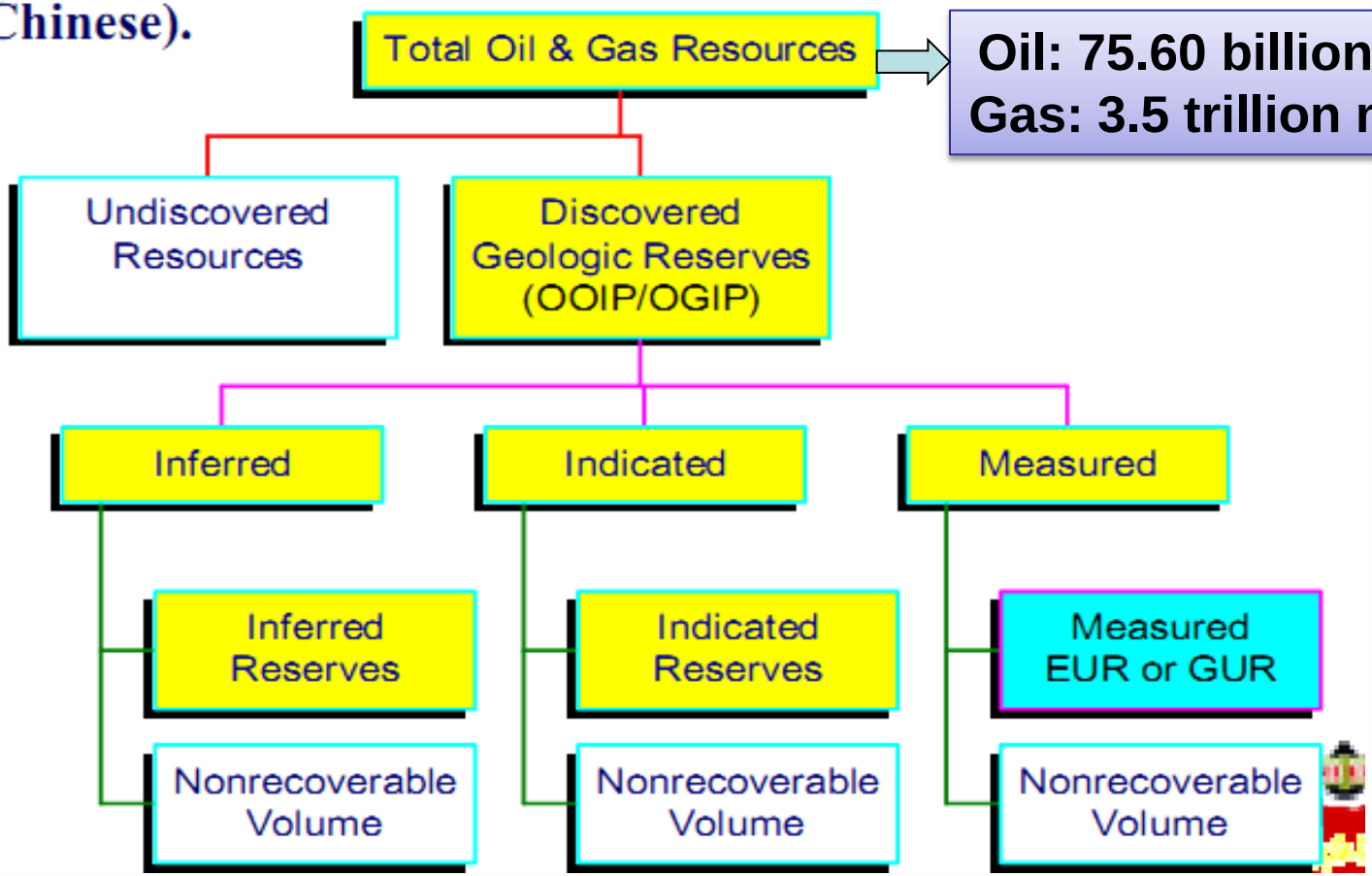
Background

Reserves Activity Organization



Reserve Classification System

The current system is also a three-class system but mainly for the classification of OOIP/OGIP (*Geologic reserves* in Chinese).



Reserve Classification System

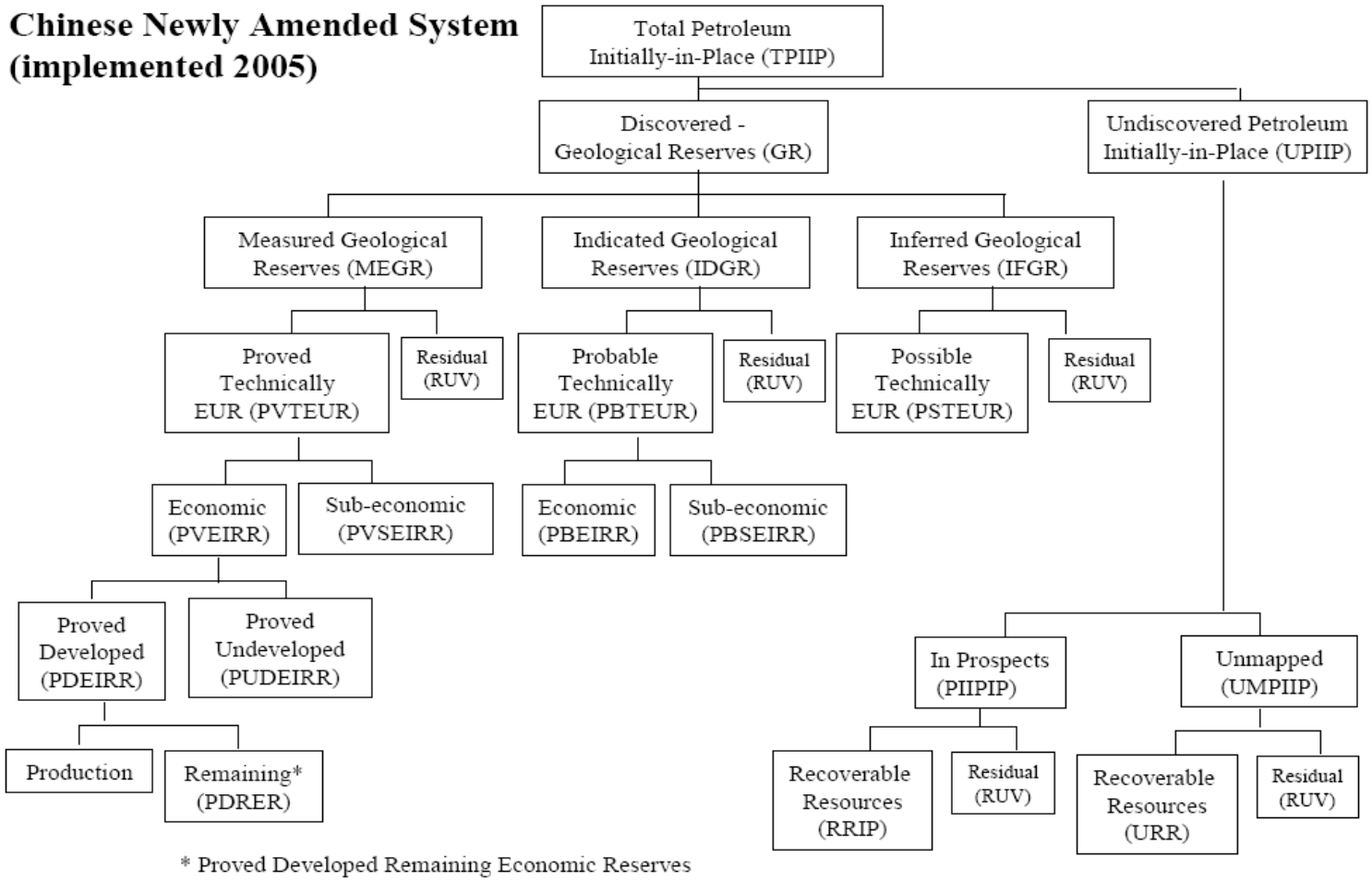


Figure 1: Classification Framework of Chinese Petroleum Resources/Reserves

Reserve Classification System

Technically, the assignment of different classes of geologic reserves is based on the phases of exploration and development or the maturity of E&D and the knowledge of the specific reservoirs or blocks (mainly on geology).

Main Phases	Resource Classes
Early exploration and discovery	Inferred
Exploration well test with industrial flows	Indicated
End of exploration to development	Measured

Reserve Classification System

Criteria to determine industrial flows in a well (the lowest limits to calculate reserves) :

Depth of Reservoir (m)	Well Test Production	
	Oil (tonne/d)	Gas ($10^4 m^3/d$)
≤500	0.3	0.05
>500～1000	0.5	0.1
>1000～2000	1.0	0.3
>2000～3000	3.0	0.5
>3000～4000	5.0	1.0
>4000	10.0	2.0

Reserve Classification System

Different classes of geologic reserves require different amounts of data acquired as well, from seismic, drilling, logging, and production tests, to sampling analysis, to reflect the phases of E&D and the certainty of geologic understanding on the specific reservoir(s).

Reserve Classification System

- The classes of recoverable reserves are the same classes as corresponding geologic reserves.

- In fact, the booking of recoverable reserves of a reservoir is the estimated ultimate recoveries up to the product of an estimated in-place volume times an estimated recovery efficiency during the appraisal and development phases, even at the phase of production decline in Chinese standards.

- For the estimate of oil reserves, Chinese standards typically take into account water drive factors whenever water injection will be performed, since most of the oil reservoirs need and have been produced with secondary drive energy.

Reserve Classification System

- Measured Geological Reserves are estimated with a high level of confidence after the reservoirs have been proved economically recoverable by appraisal drilling. A reasonable well spacing should be used in the delineation of measured limits. All parameters in the volumetric approach should have a high degree of certainty.

Reserve Classification System

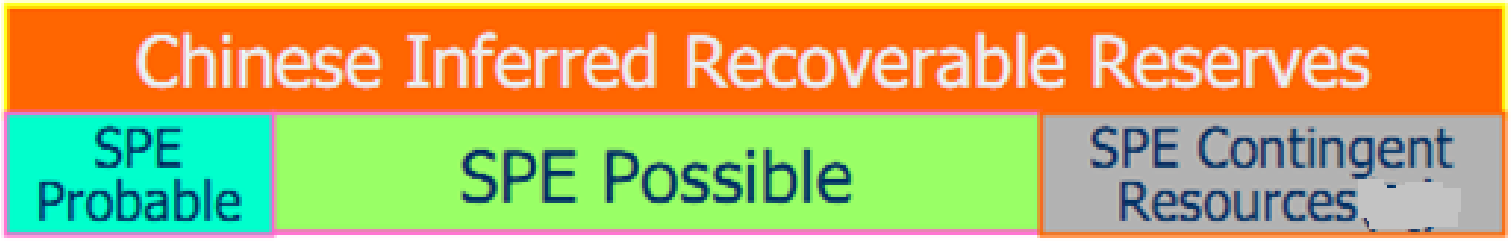
- Indicated Geological Reserves are estimated with a moderate level of confidence when economic flow is obtained from a prospect well at the general exploration phase
- Inferred Geological Reserves are estimated with a rather low level of confidence characteristic of an early discovery phase or in the case where interpretations indicate that additional oil and/or gas layers exist.

Reserve Classification System

- **Measured geologic reserves** are estimated after completion or near completion of evaluation drilling. Under the present technical and economic conditions, they are reliable resources for development and social economic profit. Measured geologic reserves are the basis to make a development plan and to determine investment in construction of field development and to study production performance.

- In estimation, modern geophysical exploration technology and reservoir boundary detecting approach should be used as much as possible to identify reservoir type, structure feature, reservoir thickness, lithology, petrophysics, water saturation and/or fluid boundaries.

Comparison of Reserve Definitions



Comparison of Reserve Definitions

Chinese Newly Amended System (implemented 2005)

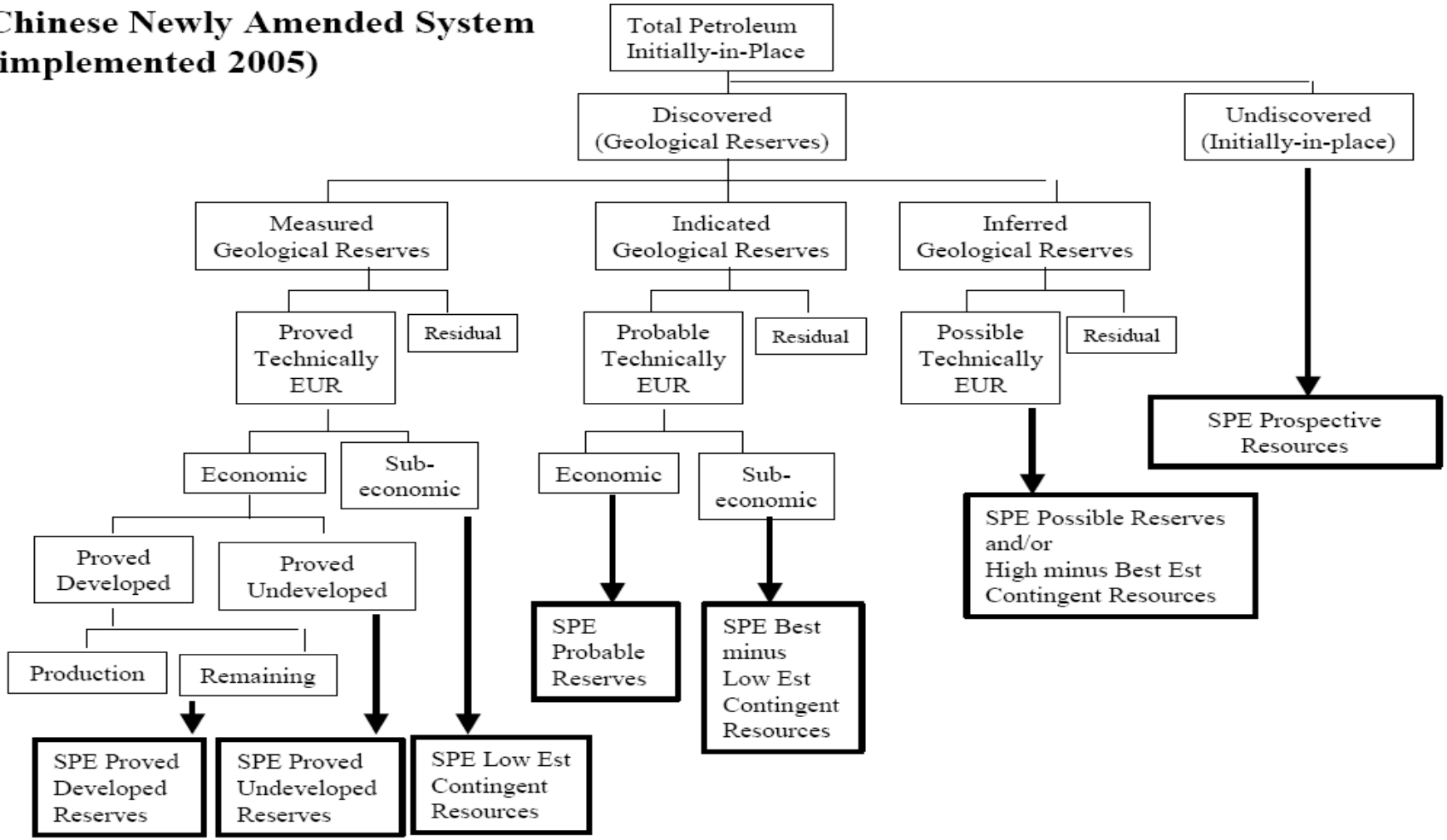
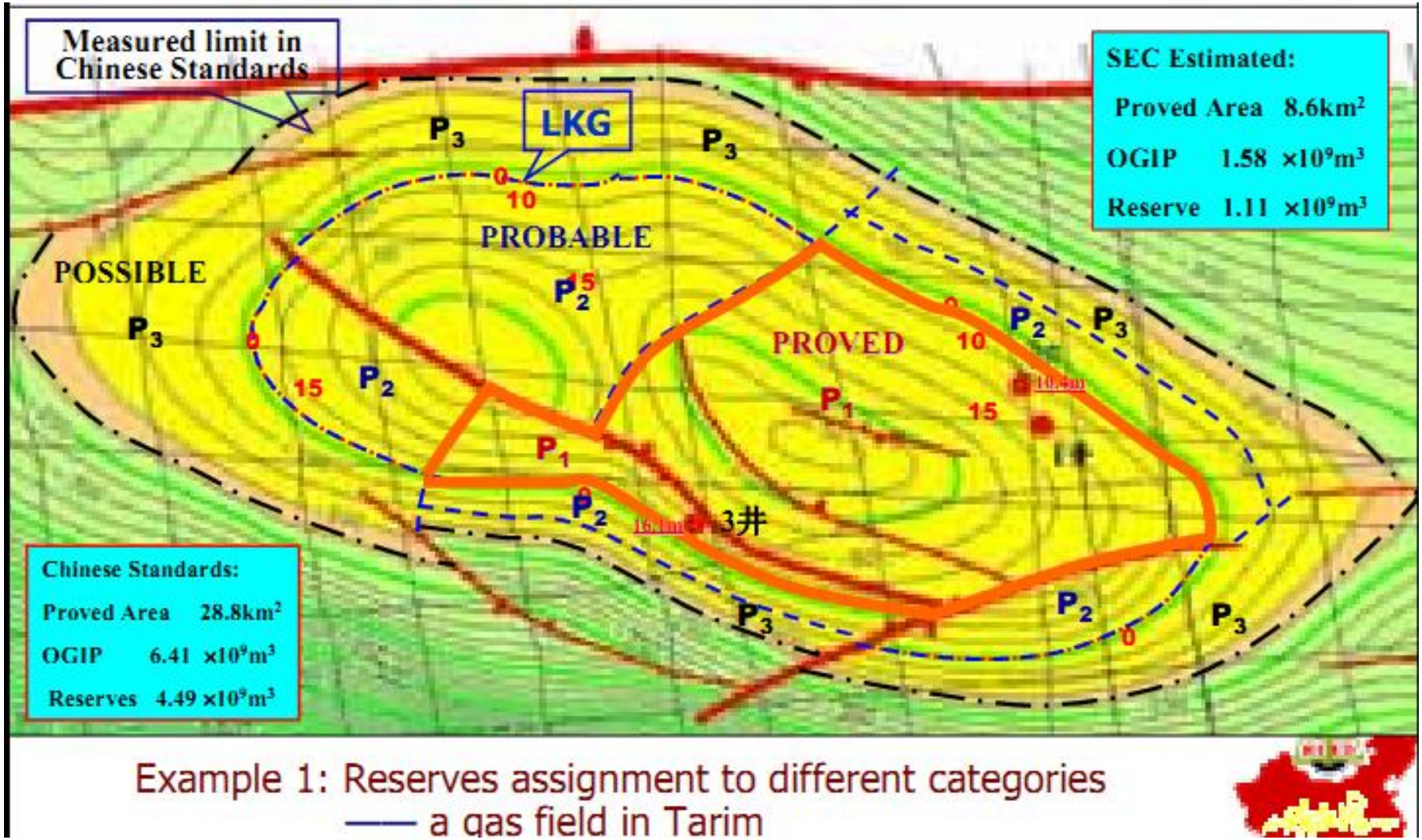


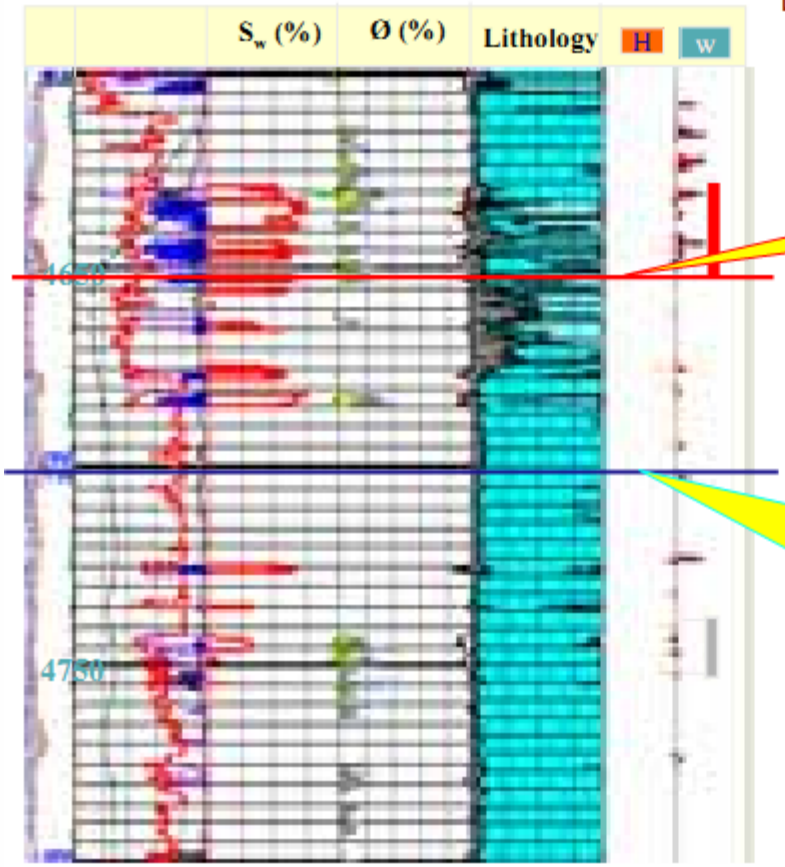
Figure 2: Comparison of Chinese (2005) and SPE Classifications

Examples



Example 1: Reserves assignment to different categories
—— a gas field in Tarim

Examples



Example 2: LKH interpretation

—— a gas field in Dagang

SPE Proved limit — LKG

Chinese estimated Measured limit — middle point of LKG and the top of perforated dry interval.

Thanks for your attention!