Evolution Resources

A comparison of the Chinese and Russian standards with PRMS

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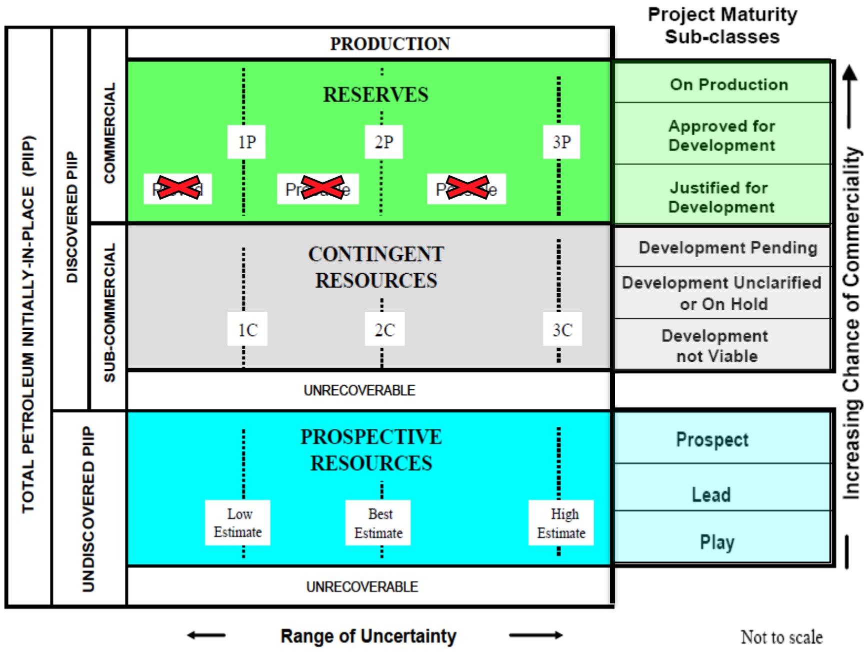
Intro: Reserves definition

According to SPE PRMS 2007:

- **RESERVES** are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be: discovered, recoverable, commercial, and remaining (as of the evaluation date) based on the development project(s) applied.
- **CONTINGENT RESOURCES :** ……. *“more exiting stuff…”*
- **PROSPECTIVE RESOURCES :** …….. *“even more exciting….”*



Project Maturity Sub-classes

TOTAL PETROLEUM INITIALLY-IN-PLACE (PIIP)

DISCOVERED PIIP

COMMERCIAL

PRODUCTION

RESERVES

1P

2P

3P

On Production

Approved for Development

Justified for Development

SUB-COMMERCIAL

CONTINGENT RESOURCES

1C

2C

3C

Development Pending

Development Unclarified or On Hold

Development not Viable

UNRECOVERABLE

UNDISCOVERED PIIP

PROSPECTIVE RESOURCES

Low Estimate

Best Estimate

High Estimate

Prospect

Lead

Play

UNRECOVERABLE

Increasing Chance of Commerciality

Range of Uncertainty

Not to scale

Introduction

So, what are Reserves?

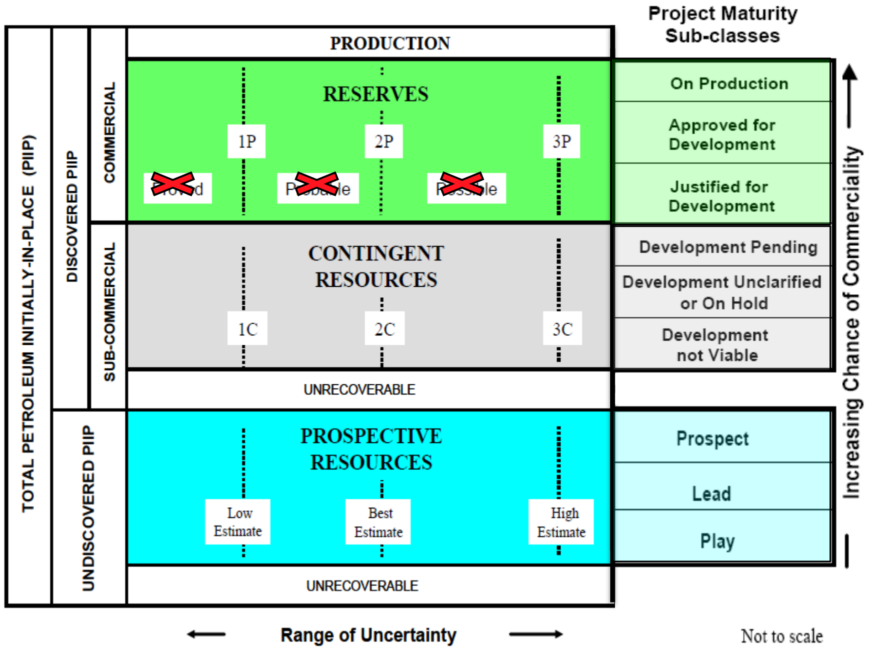
- **In China and Russia:**
  - The word “Reserves” does not translate easily, and it also refers to volumes in place (e.g. “geological reserves”)
  - “Resources” are non-discovered volumes
- **In Europe, US and Canada:**
  - Generally, we are talking about “sales volumes”
  - “Reserves” booked under SEC, PRMS or COGEH can be substantially different.
  - “Experts” also disagree…
- **In the solid mineral industry:**
  - “Reserves” usually refer to a GRV associated with a grade (CRIRSCO, JORC)
- **In the renewable energy sector:**
  - “Reserves” are mostly linked to facility lifetime (e.g. UNFC)
  - “Resources” are linked to the replenishment rate and are infinite (in theory…)

Reserves guidelines

SPE PRMS

Already discussed today – A few points that I would like to emphasize on:

- **No split conditions:**
  - Commitment requirements are the same for 1P, 2P, 3P
  - Reserves do NOT move from possible, to probable to proved
  - Similarly, reserves cannot be downgraded reserves from proved to probable. Downgraded projects becomes CR !!! (this is a convenient – yet non compliant - way to overestimate the 2P case).
  - One liner in new PRMS – if it makes it to the final version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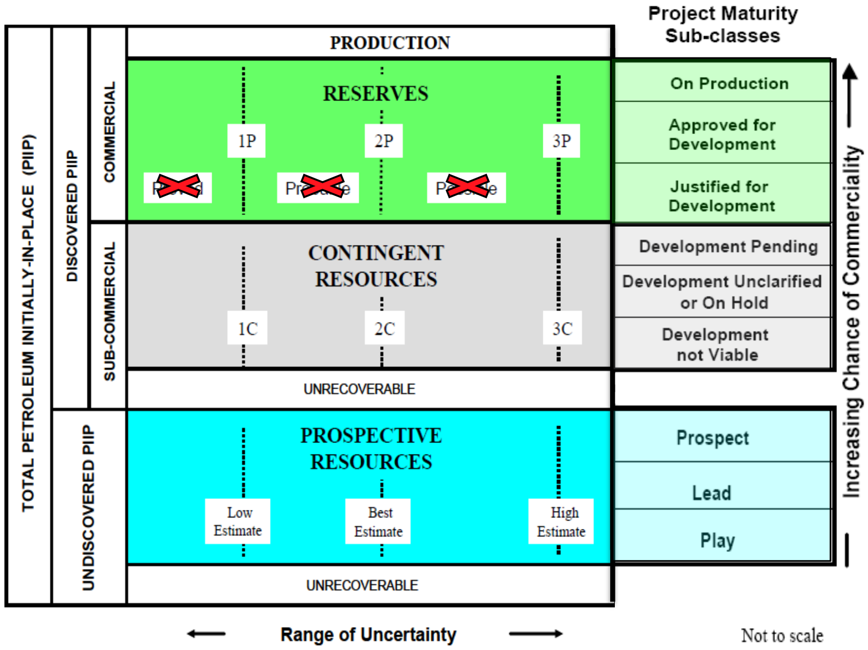
- **personal notes (*not part of PRMS - unfortunately*):**
  - Avoid the incremental approach if you may. This is coming from the old 1 offset rule from US, and can be confusing.
  - Scrap the terminology "proved", "probable" & "possible". A "probable" project does not exist as such. It is approved (or expected to be soon), or it is not (no split conditions). 1P, 2P, 3P is merely a range of uncertainty.

Reserves guidelines

SPE PRMS

- **From the joined efforts of the SPEE and WPC (1997)**
- **Reporting of 1P, 2P & 3P (Low, Mid and High case)**
- **Companies tend to focus on 2P (mid case) so**
  - The NPV of the company is a mainly best estimate
  - NPV does not (rarely) include 2C volumes
- **Project maturity is the same in 1P, 2P & 3P:**
  - “Probable” projects are Contingent Resources
  - No split conditions (in theory…..)
  - Full commitment is required (or expected to be forthcoming – justified)
- **Economics:**
  - Companies can use incremental prices for reporting
  - Price deck is not fixed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** Personal preference: as far as possible, avoid using the “Proved, probable and possible” terminology*

Russian guidelines

Note

This presentation has been built based on the work completed with the GKZ department in the context of the RF2013 guidelines mapping to UNFC2009. This work was headed for the TAG by John Etherington.

Although the GKZ did provide the complete translation for the RF2013 guidelines, they did not build or review this presentation. As such, the information provided are ER's understanding of RF2013, based on the work completed between the Expert's team of the UN and the Russian authorities.

Introduction to RF2013

RF2013 is a volume based guideline, with 4 main categories.

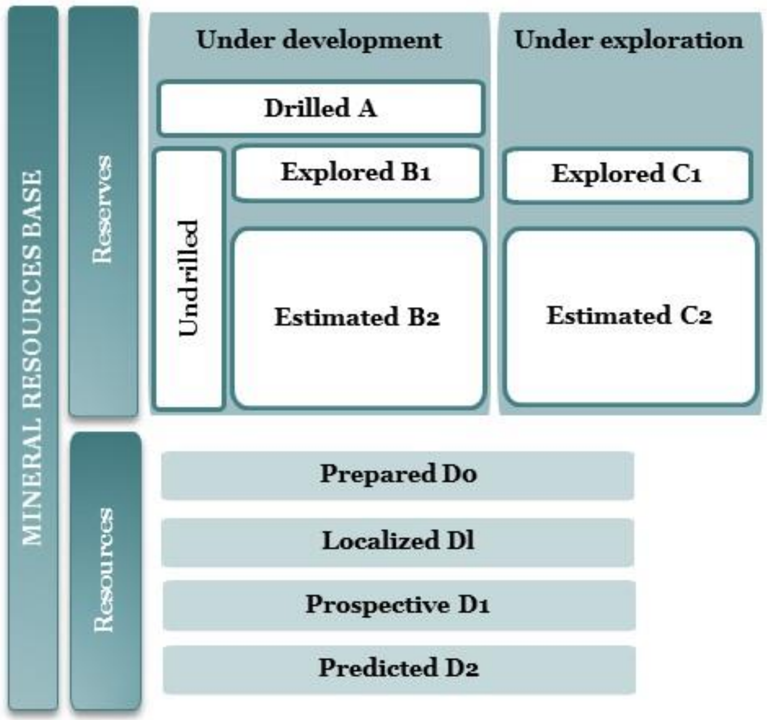
Simplifying at the utmost:

- Category "A": wells have been drilled. The area is developed
- Category "B": (Undrilled, development approved)
- Category "C": (Undrilled, under investigation)
- Category "D": exploration and prospective resources.

Also (same as in China)

- "Reserves" = Discovered (in place, recoverable, stranded…)
- "Resources" = Not discovered yet

RF2013 Classification of reserves


MINERAL RESOURCES BASE
Reserves
Resources
Under development
Under exploration
Drilled A
Undrilled
Explored B1
Estimated B2
Explored C1
Estimated C2
Prepared D0
Localized Dl
Prospective D1
Predicted D2

RF2013 introduced the concept of

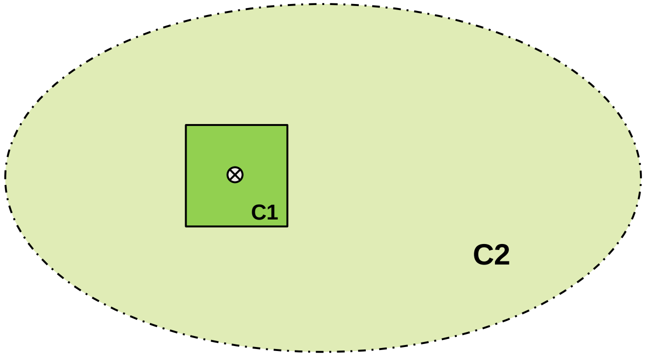
- A*, B*, C*, D*: Volumes that are recoverable, but sub-economic
- A**, B**, C**, D**: Volumes that are technically non-recoverable (e.g. stranded oil).

Introduction to RF2013

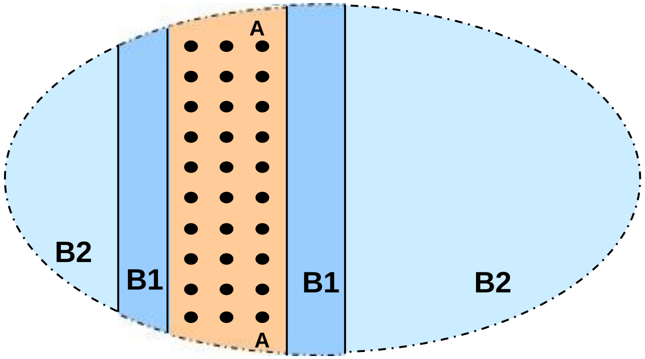
RF2013 is based on the geological knowledge:

- **Category “C”**
  - C1 corresponds to the undeveloped area which is close to existing exploration wells. The development is not planned yet
  - C2 corresponds to the volumes further away from control wells. Much uncertainty remains and development is not planned yet (based on seismic)
- **Category “B”:**
  - B1 corresponds to the undrilled area which is close to existing wells and ready for development as per FDP.
  - B2 corresponds to volumes further away from control wells, where more uncertainty remains. The development of this area is still covered by the FDP but it "might" (CR???) depend on further drilling. In principle, this is not an upside, and the volumes are still a best estimate (well……)
- **Category “A”: developed**

Exploration/appraisal stage



Development stage



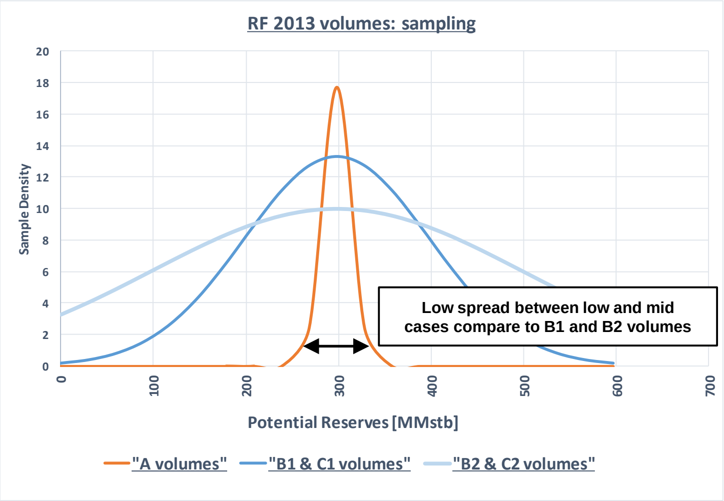
For each category, the volumes provided are best estimates (P50 case).

Main misconceptions

Usual mistakes and assumptions from auditors for mapping RF2013 to PRMS:

- **Category "A" does NOT correspond to the SPE-PRMS proved developed classification.** (e.g. newsletter July 2015)

RF2013 only provides best estimates. However, if the risk is small, the distribution is narrow compared to other cases and we sometimes approximate 1P = 2P = 3P.


RF 2013 volumes: sampling

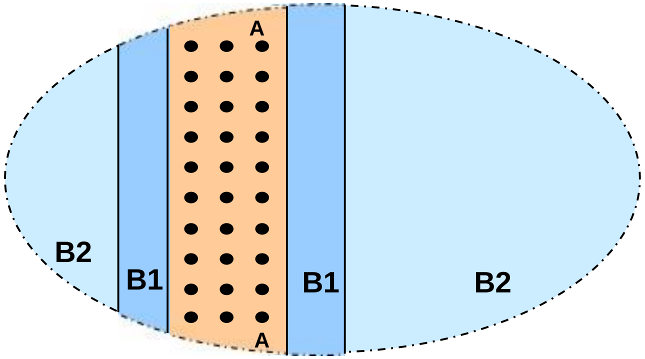
Low spread between low and mid cases compare to B1 and B2 volumes

- **"B1" and "B2"are NOT respectively "probable" and "possible" reserves under PRMS**

B1 and B2 volumes under the approved FDP are both part of the 2P case (or 2C for B2???) under PRMS, as 2 projects: both are approved, yet carrying different level of risks.

"*Exploration bias*": in theory, B2 is still a best estimate STOIIP, not an upside

Development stage

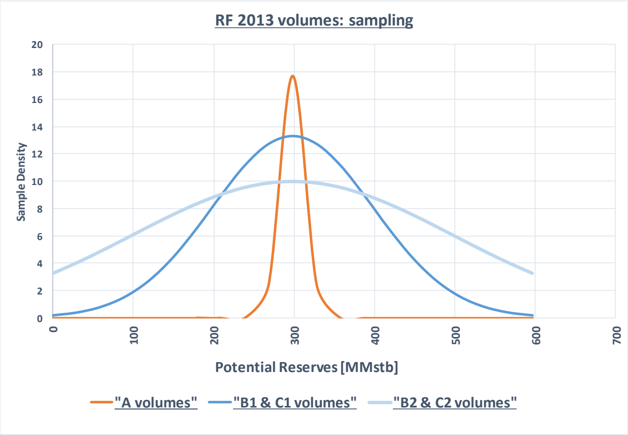


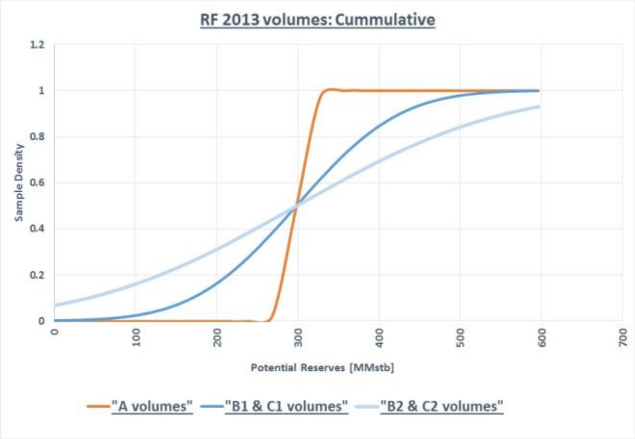
- **Category "C" is similar to B, but it corresponds to Contingent Resources (no development approved yet)**

RF2013 Conclusions

When we review Reserves under RF2013

- “A” reserves may carry a low risk, but they do not represent a proved PRMS case (1P dev.)
- Maturation in RF2013 is done from D to A
- For all discovered volumes, the classifications B1 & B2, (or C1 & C2):
  - refers to the level of geological certainty around the discovered volumes, not around the projects.
  - only provide mid cases (P50, 2P or 2C) in RF2013, for different discovered area.
  - When development is approved, the volumes are “matured” from C to B.
- We always need to check if the estimated volume in place is decent !!!





Chinese guidelines

Note

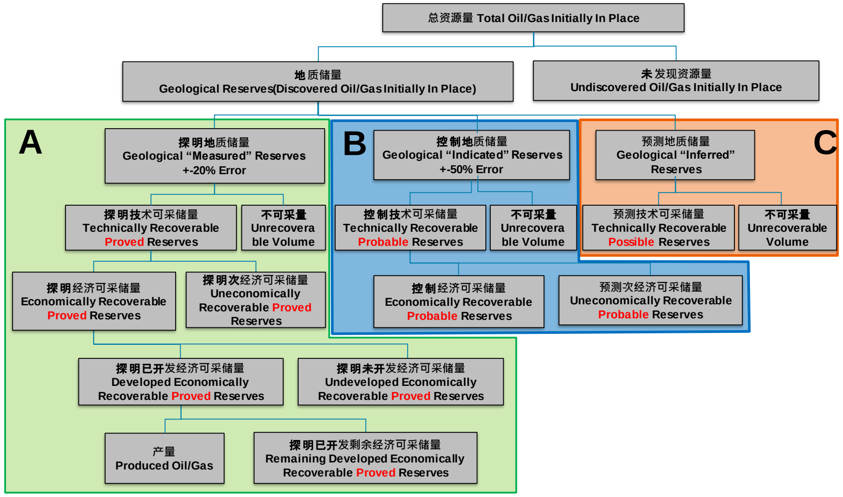
This presentation has been built based on the work completed with the MLR department and RIPED. Other members of Petrochina, CNOOC & Sinopec also provided some support in the context of the CCPR2004 guidelines mapping to UNFC2009. This work was headed for the TAG by Dominique Salacz.

Although the MLR did provide the complete translation for the RF2013 guidelines, they did not build or review this presentation (validation of the mapping by the MLR is pending). As such, the information provided are ER’s understanding of CCPR2004, based on the work completed between the Expert’s team of the UN and the Chinese authorities.

Chinese guidelines

CCPR2004

- **Mandatory for reporting to the MLR**
- **Dated 01.01.2004, and based on the old Russian classification**
- **Volume based system. Maturity depends on Geological knowledge**
- **Includes 3 main classes:**
  - Inferred / Possible
  - Indicated / Probable
  - Measured / Proved



总资源量 Total Oil/Gas Initially In Place

地质储量
Geological Reserves(Discovered Oil/Gas Initially In Place)

未发现资源量
Undiscovered Oil/Gas Initially In Place

A

探明地质储量
Geological "Measured" Reserves
+-20% Error

探明技术可采储量
Technically Recoverable Proved Reserves

不可采量
Unrecoverable Volume

探明经济可采储量
Economically Recoverable Proved Reserves

探明次经济可采储量
Uneconomically Recoverable Proved Reserves

探明已开发经济可采储量
Developed Economically Recoverable Proved Reserves

探明未开发经济可采储量
Undeveloped Economically Recoverable Proved Reserves

产量
Produced Oil/Gas

探明已开发剩余经济可采储量
Remaining Developed Economically Recoverable Proved Reserves

B

控制地质储量
Geological "Indicated" Reserves
+-50% Error

控制技术可采储量
Technically Recoverable Probable Reserves

不可采量
Unrecoverable Volume

控制经济可采储量
Economically Recoverable Probable Reserves

预测次经济可采储量
Uneconomically Recoverable Probable Reserves

C

预测地质储量
Geological "Inferred" Reserves

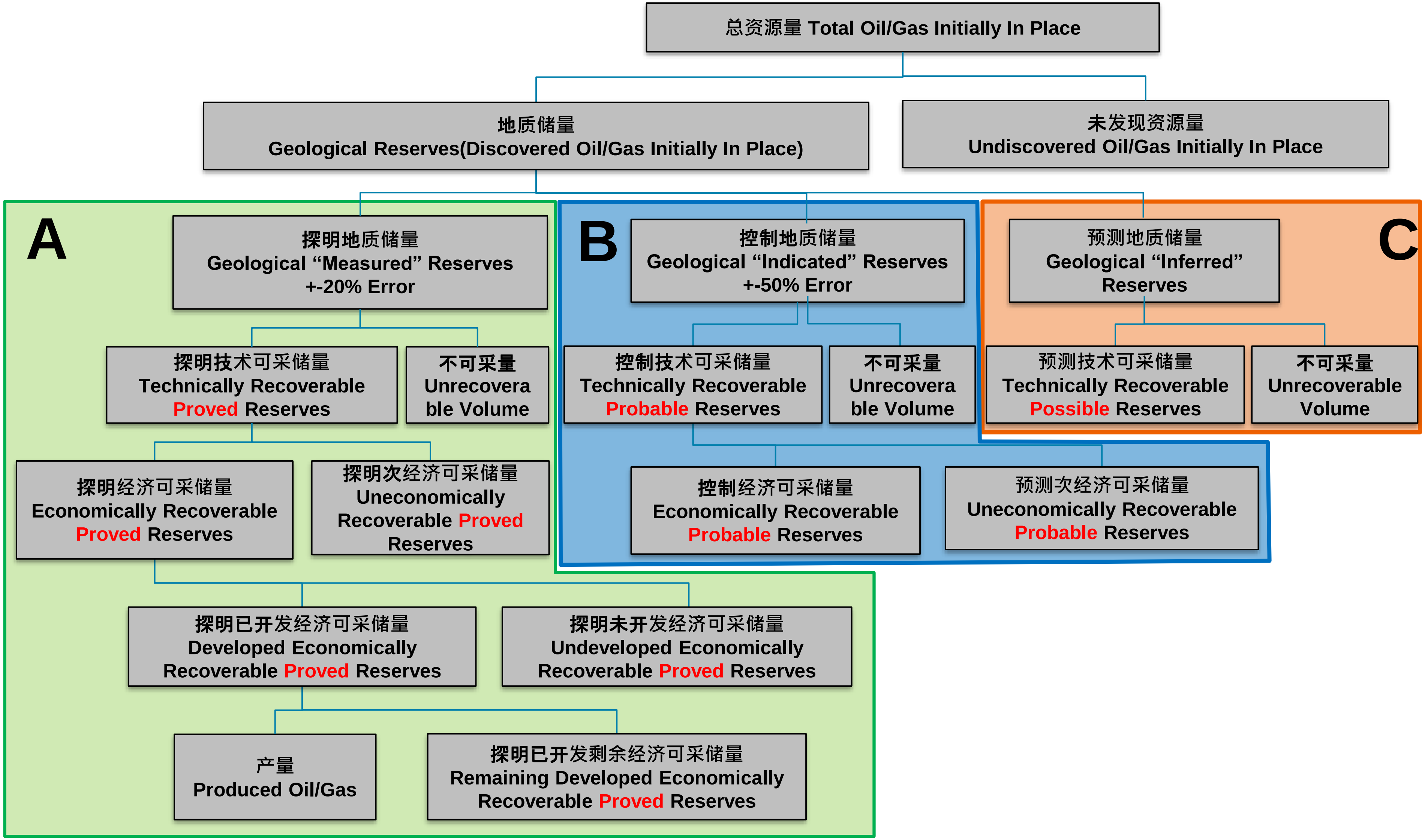
预测技术可采储量
Technically Recoverable Possible Reserves

不可采量
Unrecoverable Volume

This terminology has nothing to do with the proved, probable and possible classification in PRMS, COGEH…

- **All estimations are (more or less) based on the best estimate (similar to RF2013)**

CCPR2004



总资源量 Total Oil/Gas Initially In Place

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Geological Reserves(Discovered Oil/Gas Initially In Place)

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Undeveloped Economically Recoverable Proved Reserves

产量
Produced Oil/Gas

探明已开发剩余经济可采储量
Remaining Developed Economically Recoverable Proved Reserves

B

控制地质储量
Geological “Indicated” Reserves
+-50% Error

控制技术可采储量
Technically Recoverable
Probable Reserves

不可采量
Unrecoverable Volume

控制经济可采储量
Economically Recoverable
Probable Reserves

预测次经济可采储量
Uneconomically Recoverable
Probable Reserves

C

预测地质储量
Geological “Inferred” Reserves

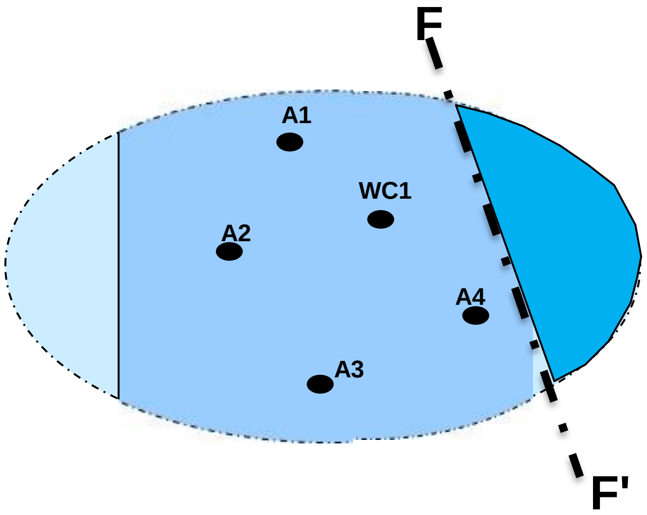
预测技术可采储量
Technically Recoverable
Possible Reserves

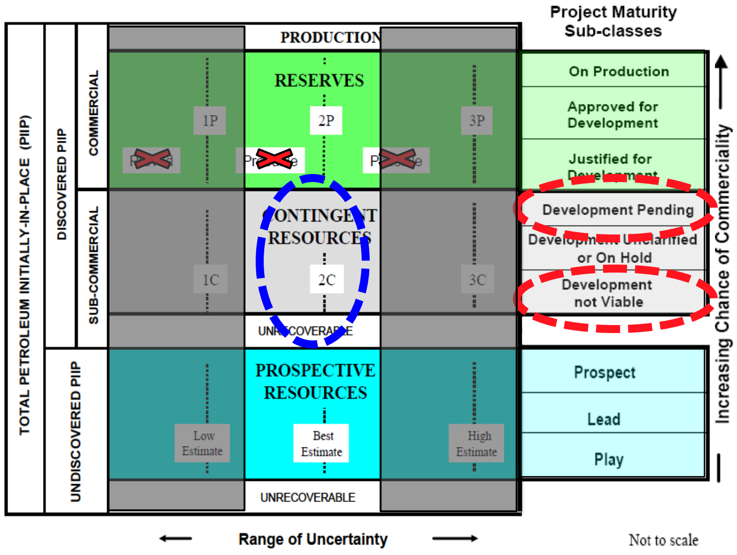
不可采量
Unrecoverable Volume

Chinese guidelines

Step by step:

- **Discovery of the asset (E.g. Wildcat well)**
  - No development project yet (under appraisal)
  - You have geological **inferred "reserves"** in CCPR2004
  - You have **"possible reserves"** in CCPR2004
  - No economics yet
  - *In PRMS, those volumes would probably be in CR Unclarified*
- **Better geological knowledge:**
  - No approved development project: concepts are being investigated in view of future development
  - More appraisal has been done
  - You have geological **Indicated "reserves"** in CCPR2004
  - You have **"probable reserves"** in CCPR2004
  - Preliminary economics are being computed for various scenarios
  - *In PRMS, those volumes might be in Contingent Resources Pending*


F
A1
WC1
A2
A4
A3
F'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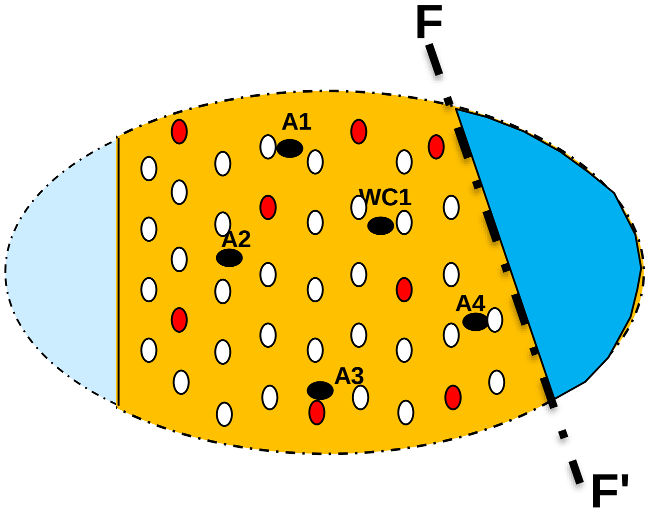
Chinese guidelines

Step by step:

- **Increasing geological knowledge (lower uncertainty on STOIIP):**
  - **Development plan and financing are approved**
  - You have geological Measured "reserves" in CCPR2004
  - You have "proved reserves" in CCPR2004
  - "Firm" economics are completed
  - *In PRMS, those volumes might be called 2P Undeveloped, as projects are signed off*
- **Producing:**
  - Development plan has started
  - You have geological Measured "reserves" in CCPR2004
  - You have "proved producing reserves" in CCPR2004
  - "Firm" economics are completed
  - *In PRMS, those volumes might 2P Undeveloped, as projects are signed off*


F
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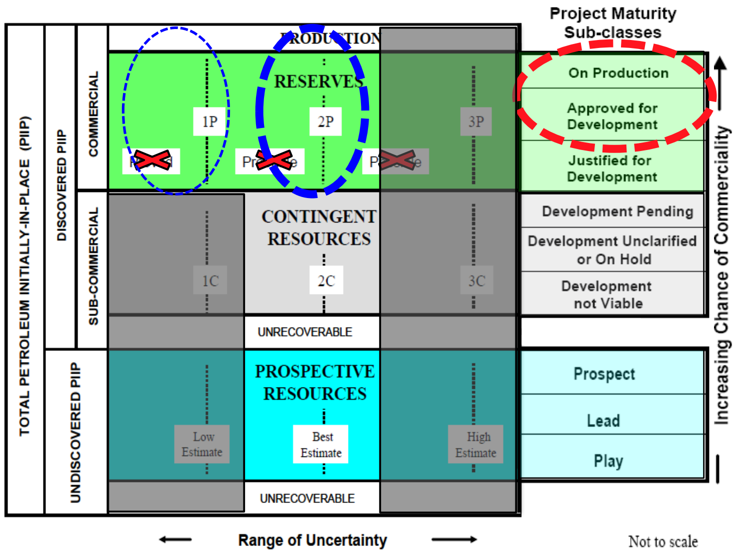
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CCPR2004 Conclusions

When we review Reserves under CCPR2004

- Proved, probable and possible "reserves" have a completely different meaning
- Proved reserves in CCPR are 2P reserves in PRMS (with approved projects)*

* *Note: although it appears that a "conservative" approach might be required*

- Probable reserves in CCPR are contingent resources in PRMS. Projects are being investigated, but development has not been approved yet.
- Possible reserves in CCPR remain contingent resources in PRMS (unclarified).

- Maturation of the whole asset is based on appraisal & approval level, in parallel
- Only best estimates are provided, in theory (although we were told recently that the estimations for "proved reserves" need to be *conservative*)

Thank you

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