CCOP EPPM: Workshop on UNFC Resource Classification in Cooperation with UNECE

Overview of UNFC for Petroleum Resources, PRMS and Relationship to UNFC2009

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Outline

- Objective
- UNFC Classification for Petroleum
- PRMS
- UNFC and PRMS Mapping
- Concluding Remarks

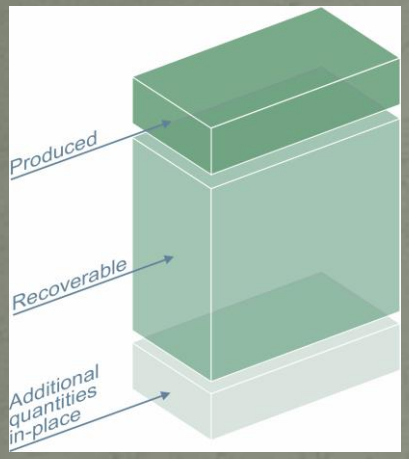
Objective

Provide key features and linkage between the UNFC 2009 for petroleum and PRMS

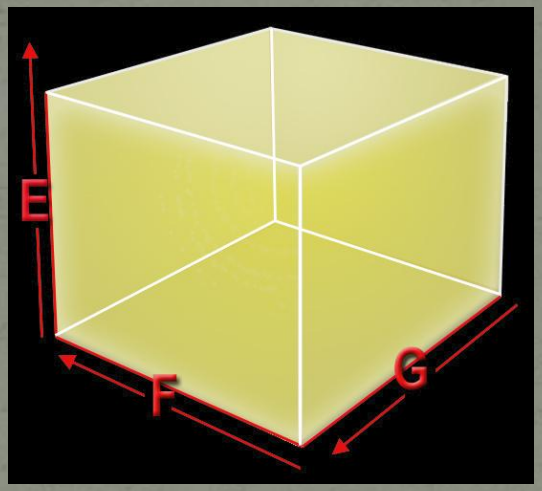
The UNFC Classification for Petroleum

UN Framework Classification (UNFC) for Petroleum

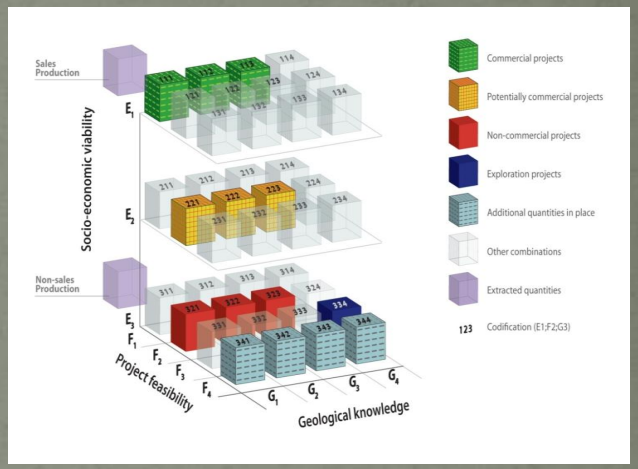
Total Initial in-Place



Principles



Classification



Economic and Social viability

- E1, E2 and E3

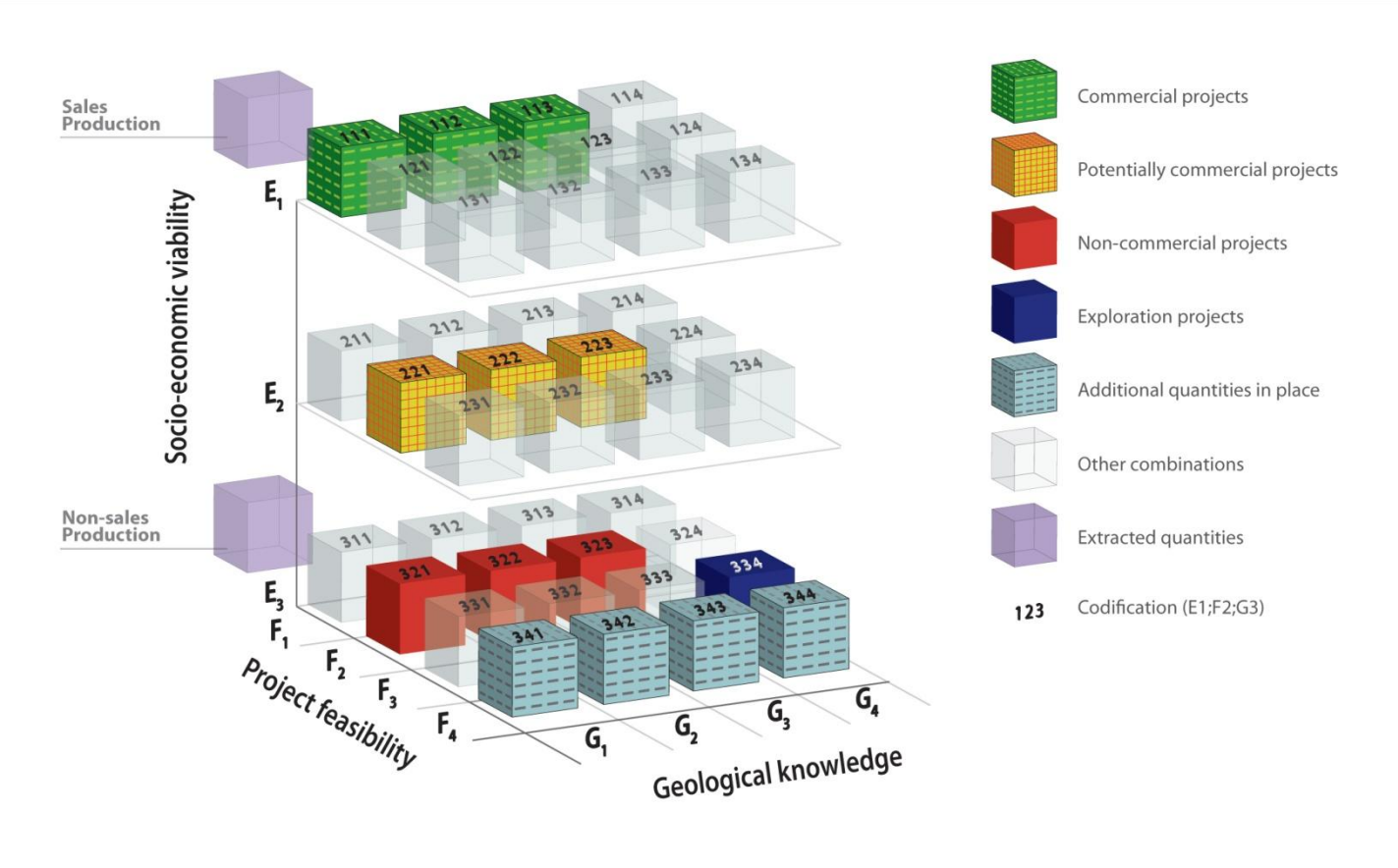
Field project status and feasibility

- F1 , F2, F3 and F4

Geological knowledge

- G1, G2, G3, G4

UNFC 3D Matrix



UNFC – E axis and F axis

- **UNFC is project-based**
- **UNFC provides granularity to distinguish between the primary reasons for different levels of maturity (i.e. economics versus feasibility) - PRMS system combines E and F into "project maturity" categories**
- **Correlation between PRMS and UNFC is straightforward**

UNFC – G axis

- **Level of confidence in the geological knowledge *and potential recoverability* of the quantities**
- **The uncertainty associated with the quantities estimated is communicated either by:**
  - **Quoting discrete quantities of decreasing level of confidence (high, moderate, low)**
  - **Generating three specific scenarios or outcomes (low, best and high)**

UNFC – G axis

- **Definitions of the G axis categories are the same for both solids and fluids**

- **The supporting explanation, however, describes how to apply these definitions to solid resources and fluids:**

  - **For resources extracted as solids, estimated project recovery for each class comes from a specific part of the deposit**

  - **For resources extracted as fluids, estimated project recovery reflects draining the accumulation as a whole**

UNFC – G axis

Category	Definition	Supporting Explanation (1)
G1	Quantities associated with a known deposit that can be estimated with a high level of confidence.	For in situ (in-place) quantities, and for recoverable estimates of fossil energy and mineral resources that are extracted as solids, quantities are typically categorised discretely, where each discrete estimate reflects the level of geological knowledge and confidence associated with a specific part of the deposit. The estimates are categorised as G1, G2 and/or G3 as appropriate.
G2	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	
G3	Quantities associated with a known deposit that can be estimated with a low level of confidence.	

UNFC – G axis

Category	Definition	Supporting Explanation (2)
G1	Quantities associated with a known deposit that can be estimated with a high level of confidence.	For recoverable estimates of fossil energy and mineral resources that are extracted as fluids, their mobile nature generally precludes assigning recoverable quantities to discrete parts of an accumulation. Recoverable quantities should be evaluated on the basis of the impact of the development scheme on the accumulation as a whole and are usually categorised on the basis of three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G2	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	
G3	Quantities associated with a known deposit that can be estimated with a low level of confidence.	

UNFC – G axis

Category	Definition	Supporting Explanation
G4	Estimated quantities associated with a potential deposit, based primarily on indirect evidence.	Quantities that are estimated during the exploration phase are subject to a substantial range of uncertainty as well as a major risk that no development project or mining operation may subsequently be implemented to extract the estimated quantities. Where a single estimate is provided, it should be the expected outcome but, where possible, a full range of uncertainty in the size of the potential deposit should be documented (e.g. in the form of a probability distribution). In addition, it is recommended that the chance (probability) that the potential deposit will become a deposit of any commercial significance is also documented.

UNFC – Commercial Projects

- **Must be E1 and F1, can be G1, G2 and/or G3**
- **For solids:**
  - **High confidence estimate = 111**
  - **Moderate confidence estimate = 112**
  - **Low confidence estimate = 113**
- **For fluids:**
  - **Low estimate scenario = 111**
  - **Best estimate scenario = 111+112**
  - **High estimate scenario = 111+112+113**

PRMS

Society of Petroleum Engineers

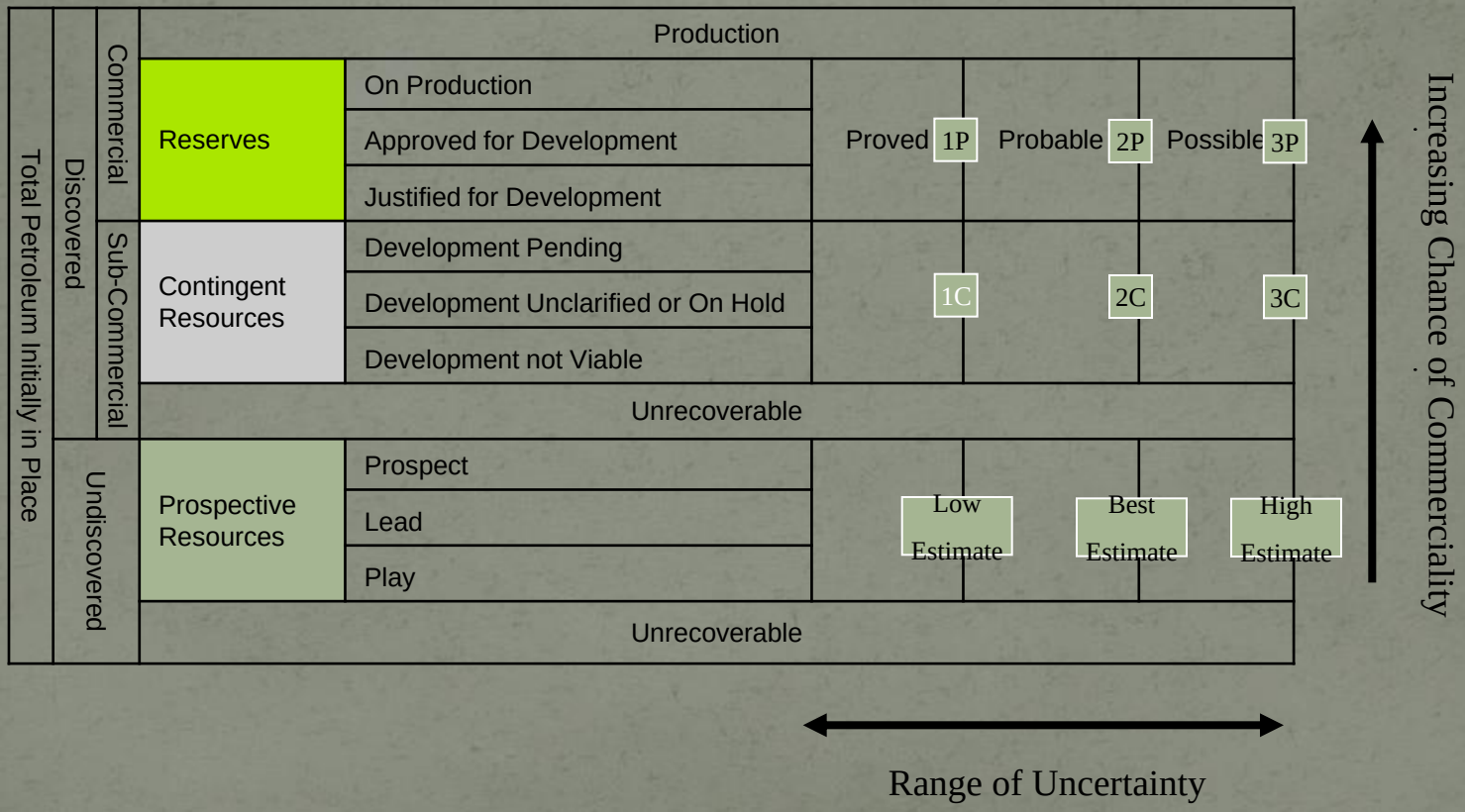
Petroleum Resources Management System (PRMS)

- **Published 2007**
- **Evergreen – maintenance and enhancement**
- **Goal to be the premier petroleum classification standard**
- **Adopted by**
  - **Industry**
  - **Financial organisation**
  - **Governments**
  - **Regulatory agencies**
  - **Reporting bodies**

PRMS Principles

- Project based
- Classify and categorise by
  - Chance of commerciality
  - Recoverable uncertainty
- Forecast of future conditions
- Deterministic and probabilistic methods
- Conventional and unconventional resources

PRMS Classification Framework



SPE Discovery Criteria

- Established through testing, sampling and/or logging the existence of a significant quantity of potentially moveable hydrocarbons
- Does not require a flowing well test
- Unconventionals
- Tracks all hydrocarbons

Commercial Criteria

- Evaluator's economic criteria
  - Forecast conditions
  - Regulator's criteria
- No significant contingencies
  - Reasonable expectation of approvals
- Intent to develop in reasonable timeframe
  - Gas cap blow-down
  - Major project with long development schedule

Volumetric Uncertainty

- Guidelines for estimation
- Covers:
  - Reference points
  - Lease fuel
  - Natural gas composition
  - Non-hydrocarbon components
  - Gas re-injection
  - Gas storage
  - Production balancing
  - Analogues
  - Aggregation
  - And many more issues

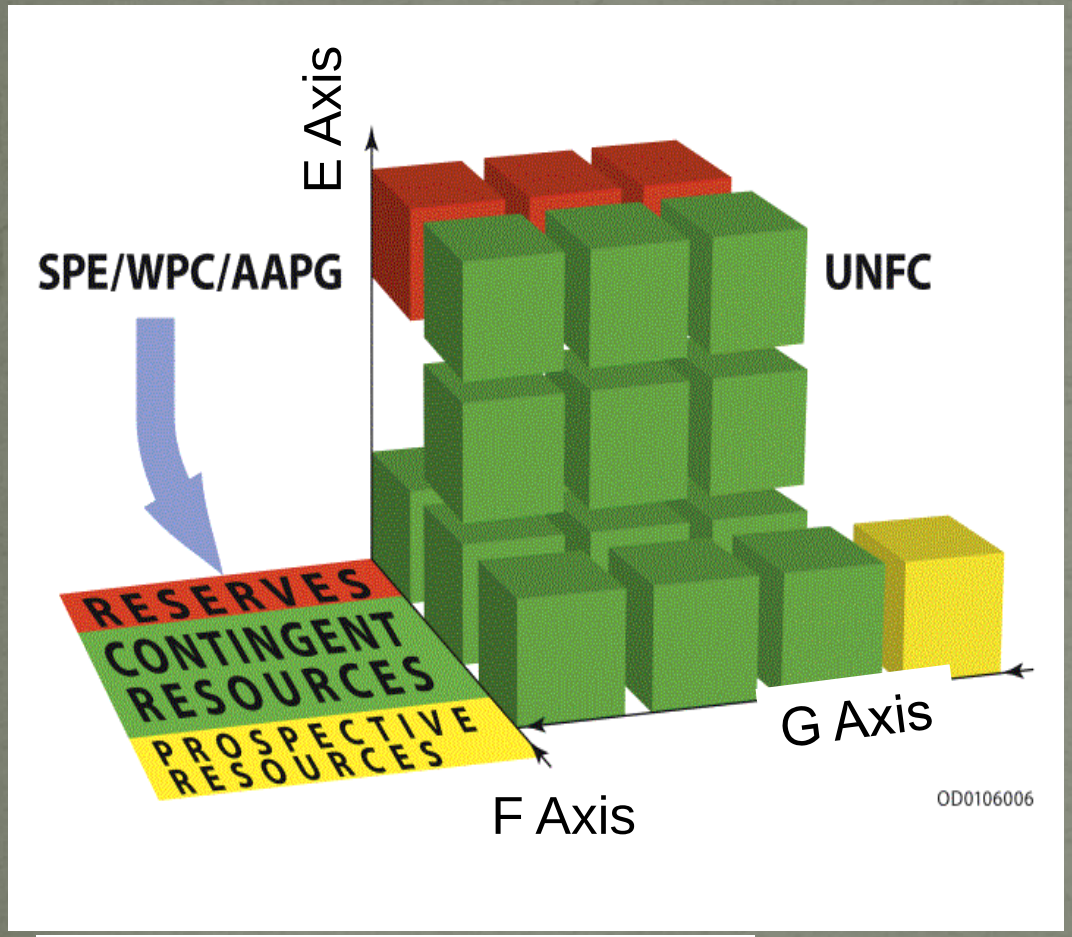
SPE PRMS Download

- From the www.spe.org website:
  http://www.spe.org/spe-app/spe/industry/reserves/prms.htm

- New 'Guidelines for Application of PRMS" were published in November 2011. These can be downloaded from the www.spe.org website:
  http://www.spe.org/industry/reserves.php

UNFC 2009 and PRMS Mapping

General Alignment of SPE/WPC/AAPG/SPEE and UNFC



E Axis Reflects Economic and Commercial Viability

F Axis Reflects Project Status Categories of Reserves and Contingent Resources

G Axis Reflects Level of Uncertainty

From SPE Paper 90839

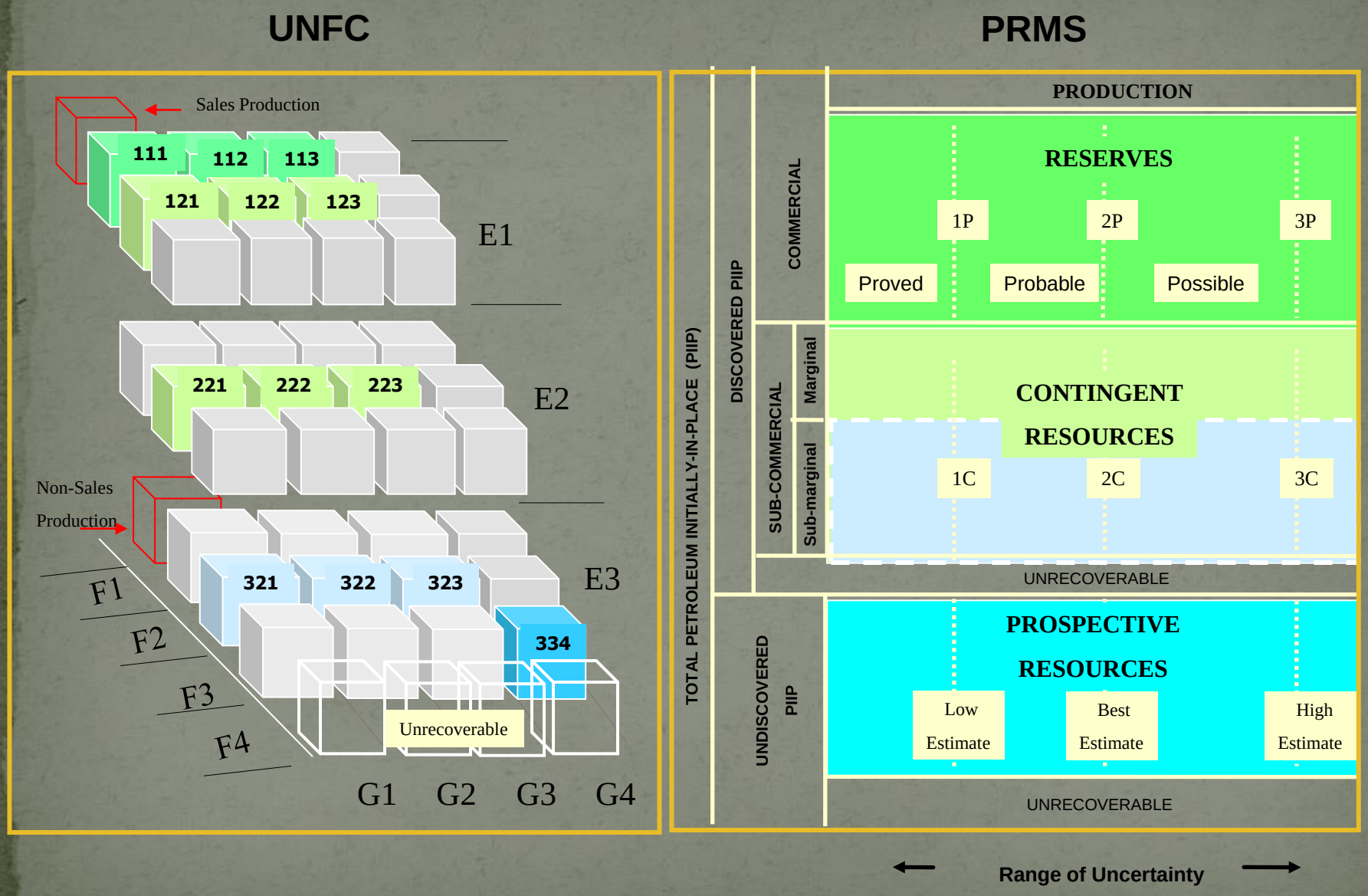
UNFC – E axis and F axis

- **UNFC and SPE-PRMS are project-based**
- **SPE-PRMS combines E and F into "project maturity" categories**
- **UNFC provides additional granularity to distinguish between the primary reasons for different levels of maturity (i.e. economics versus feasibility)**
- **Correlation can be relatively straightforward**

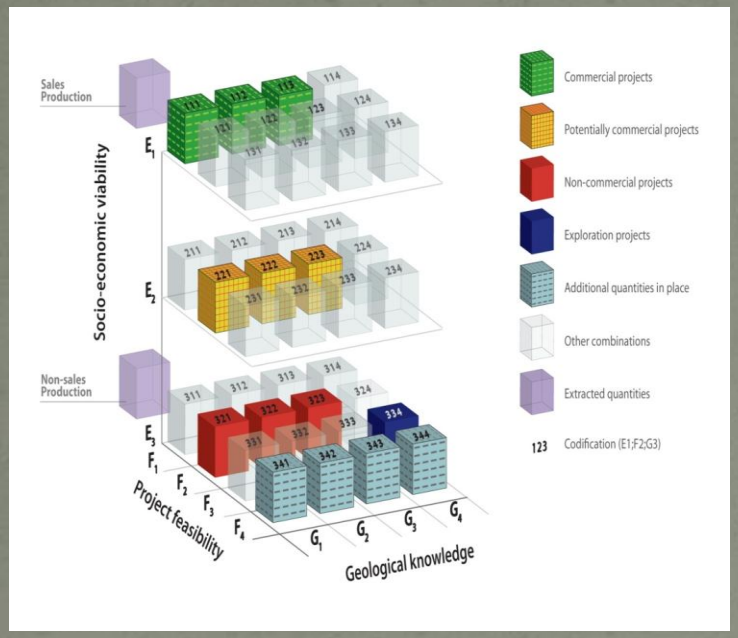
Integration of UNFC and SPE PRMS

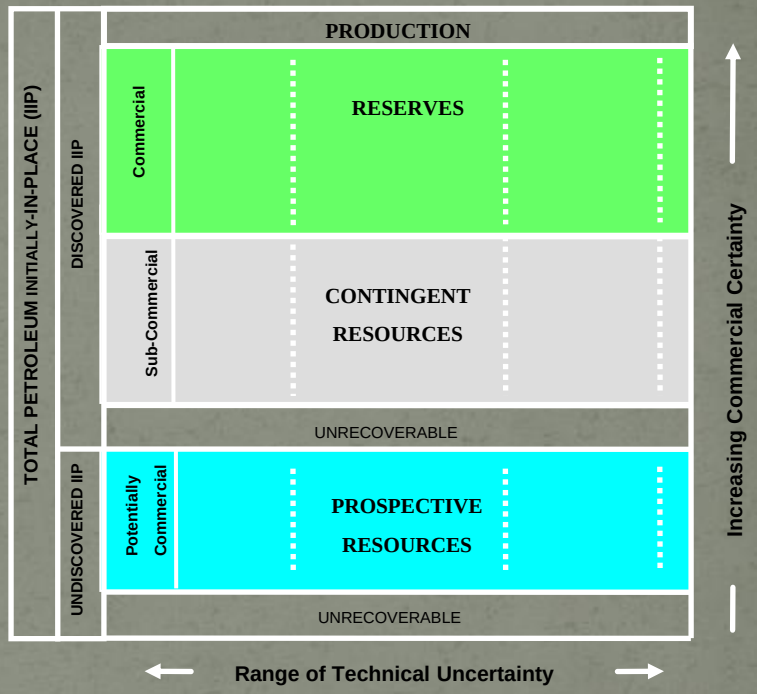
- **UNFC, PRMS classifications co-exist.**
- **UNFC can be used directly or as an integration tool**
- **PRMS used by private industry for maintenance with prior evaluations**
- **The overarching principles of should be the same**
- **UN Task Force mapping further integration of the guidelines**

Aligning PRMS-UNFC Classifications



SPE Integration with UNFC

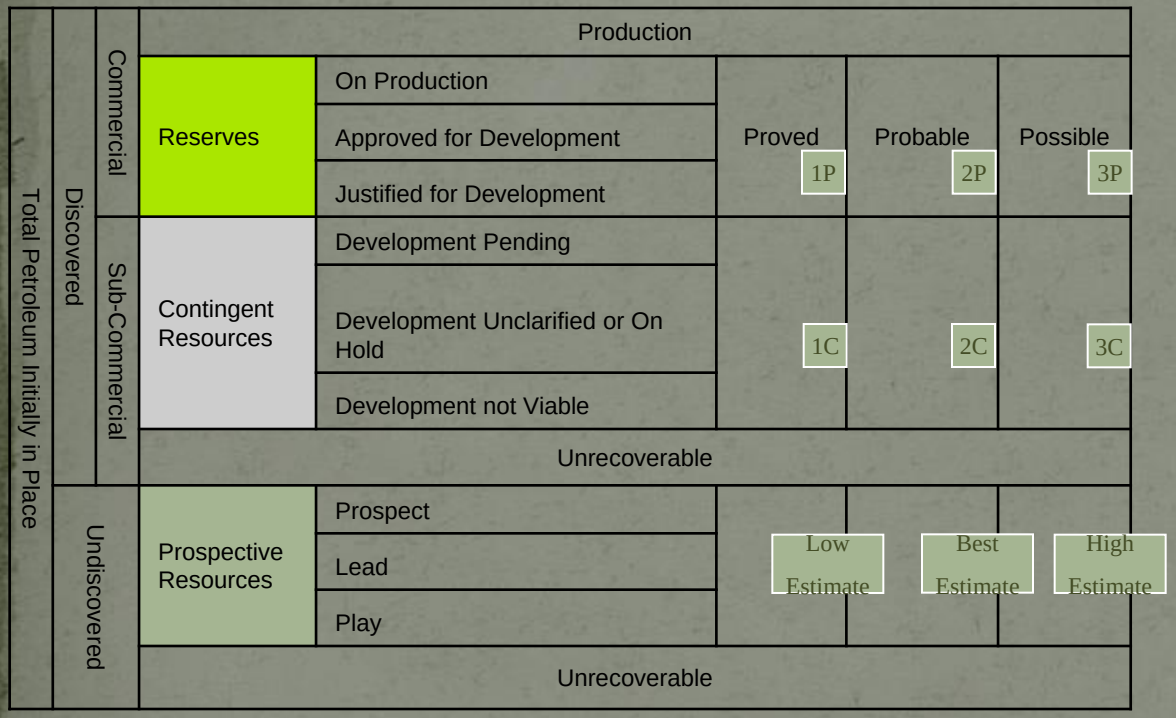




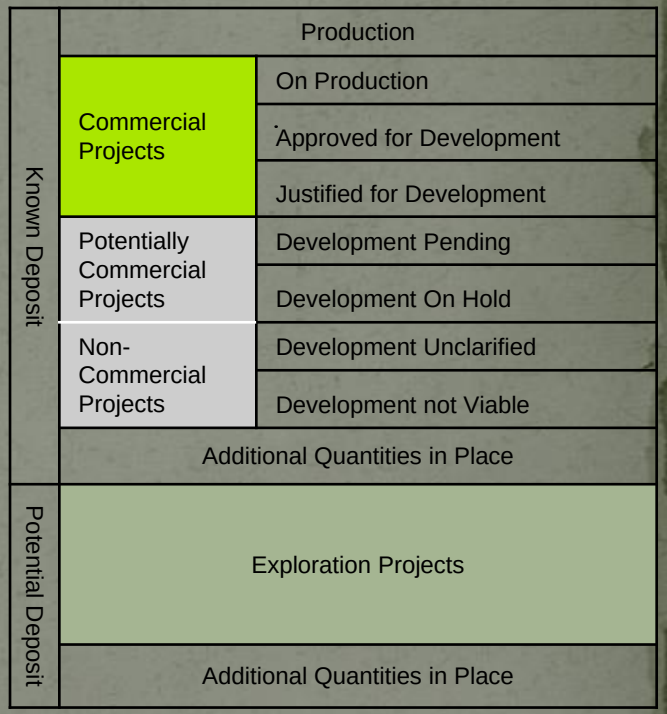
The concept of a common, language neutral, classification system applicable to all mining and petroleum reserves and resources is inherently attractive!

PRMS and UNFC 2009

PRMS



UNFC 2009



Concluding Remarks

- **UNFC2009 provides common language for classification and potential reporting**
- **PRMS provides classification for petroleum resources and reserves**
- **PRMS was used for guidance by the SEC to update reporting guidelines in 2008**
- **UNFC2009 and PRMS are aligned at high level**

Conclusions

- **UNFC-2009 provides for a common language for classification and reporting, regardless of extraction methodology**
- **There is increasing overlap between the minerals and petroleum sectors**
  - **The two industry sectors (and the regulators) have yet to address this issue**
- **SPE petroleum systems are very well aligned with UNFC-2009 at a high level**