

CLASSIFICATION ISSUES ASSOCIATED WITH UNCONVENTIONAL RESOURCES

*David Elliott
Alberta Securities Commission
28 April 2010*

**UNECE Expert Group on Resource Classification
Geneva, 28-30 April 2010**

WHY CLASSIFY RESOURCES?

- Non-Reserves Portion of Hydrocarbon Assets are Increasing in Importance
- **COMMUNICATION:**
 - To Separate Resource Estimates Into Uncertainty/Risk Categories for Making Decisions
 - To Identify Long-Term Opportunities
 - Resources Supply Planning

DIFFERENT PERCEPTIONS (Simplified)

	TIME FRAME	PAYS TAXES, ROYALTIES?	PAYS FOR CREDIT RISK?
RESOURCE STUDIES	LONG	NO	NO
GOVT. RESOURCES MGT.	LONG-MEDIUM	NO	NO
FINANCIAL NEEDS	MEDIUM-SHORT	YES	YES
BUSINESS PROCESSES	SHORT	YES	YES

CONVENTIONAL vs. UNCONVENTIONAL

	CONVENTIONAL	UNCONVENTIONAL
CONTROL	LOCAL	REGIONAL
TRAPPING	BUOYANCY/STRUCTURE	VARIOUS
BOUNDARIES	DEFINED	ILL-DEFINED ("DISPERSED")
PRODUCTION	LARGE	LITTLE
ANALOGUES	MANY	FEW
GUIDELINES	MANY	FEW TO NONE
EXPERIENCE	MUCH	LITTLE

“UNCONVENTIONAL” :

- USEFUL COLLOQUIAL TERM
- NOT A FORMAL CLASSIFICATION

CLASSIFICATIONS

- UNFC:
 - E: Social and Economic Viability
 - F: Project Feasibility
 - G: Geological Knowledge
- PRMS and COGEH (similar):
 - Project based
 - Forecast of recovery, costs
 - Technical: drilling, testing, etc.
 - Economic: NPV
- CRIRSCO

CLASSIFICATION CRITERIA

- Binary:
 - Either in a class or not in a class
- Probabilistic (Fuzzy classification):
 - In a class with a certain degree of probability
 - E.g. , 80% probability that a hydrocarbon volume is a reserve, 20% probability that it is a contingent resource
 - More reflective of the real world.

QUANTITATIVE vs QUALITATIVE

- Quantitative Deterministic – clear but inflexible
- Quantitative probabilistic – requires statistical understanding
- Qualitative:
 - Subjective in interpretation
- E.g., “reasonable certainty” means a probability of 74% with an IQR 30% (AAPG SPE conference survey, 2007)
 - Flexible

RULES vs PRINCIPLES

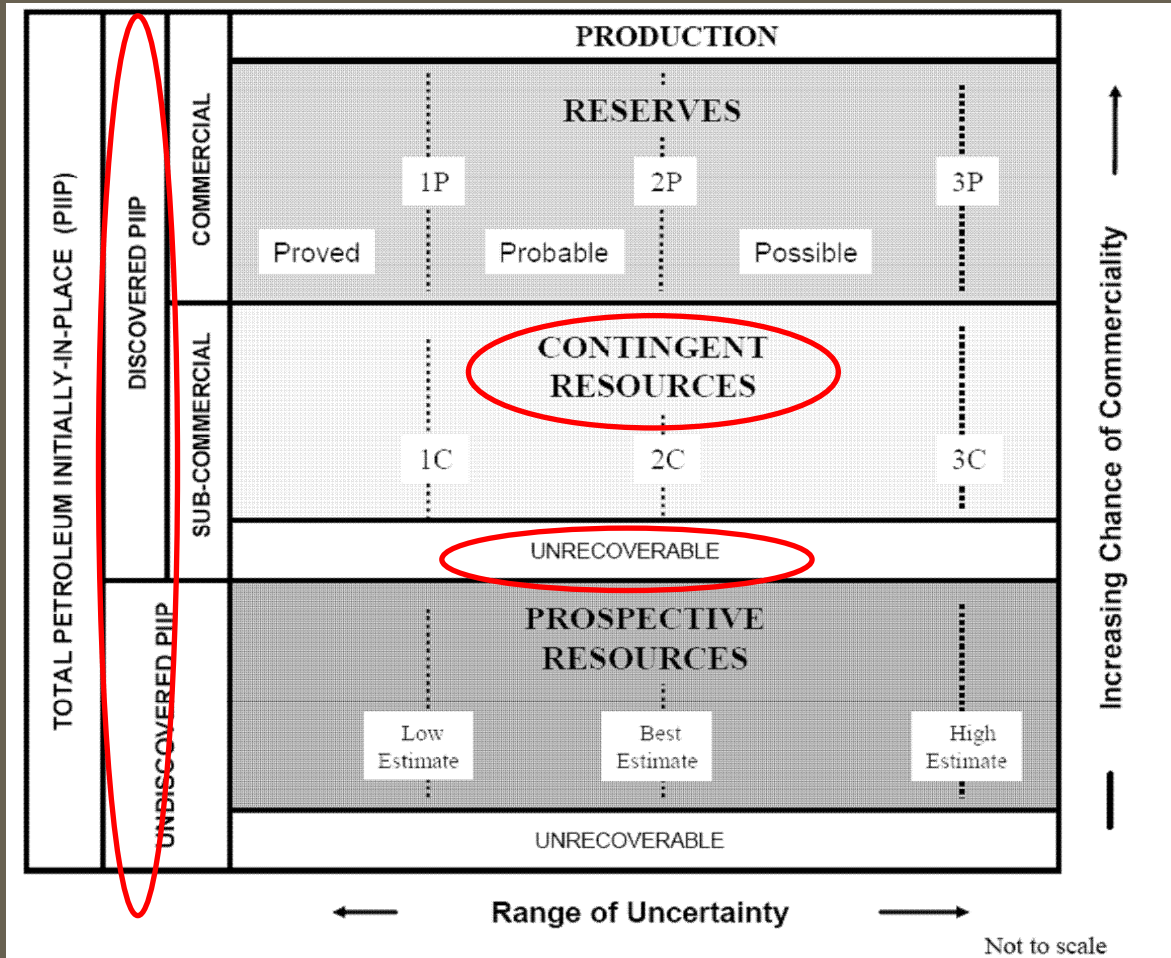
- Prescriptive Rules:
 - Clear, easy to apply
 - Little or no guidance needed
 - Inflexible and unable to deal with new issues
- Principles:
 - General, not as easy to apply
 - Considerable guidance needed
 - Flexible, better able to deal with new issues

- Recognises that Resource Estimates are Estimates and Hence, Uncertain
- Balanced Combination Of:
 - Qualitative and Quantitative
 - Principles and Rules
- Finding This Balance Is Not Easy

QUESTION

- Can volumes be classified in UNFC, PRMS, with:
 - Little uncertainty
 - Limited ambiguity
 - Insignificant differences between different individuals/ organisations?
- Yes ➡ no further action needed
- No ➡ specifications and guidelines needed

PRMS



GUIDANCE

- Guidance (PRMS, COGEH):
 - Mainly for Conventional Reserves
 - Limited For:
 - Unconventional Resources
 - Categories Other Than Reserves
 - Unrecoverable Resources

GUIDANCE

- Neither PRMS nor COGEH currently contain adequate guidance leading to consistent classification of:
 - Discovery status
 - Contingent resources
- No guidance to capture different grades of “Unrecoverable” volumes
- UNFC has better categories, but no guidance.



CLASSIFICATION ISSUES

- Some Common Issues
- Discovery Status (Discovered Petroleum Initially-In-Place, DIIP):
 - Known accumulation
- Reserves
- Contingent Resources:
 - Contingencies
 - Technology under development
- Unrecoverable Resources

COMMON ISSUE: EXTRAPOLATION (Areal assignment)

- How Far Can You Extrapolate From a Control Point?
 - Formation Presence ✓ (often)
 - Productivity ✗ (usually)
- Depends on the Geology, But Just Because a Formation is There - Doesn't Mean It Is:
 - Hydrocarbon Bearing, if it is, it is
 - Productive.

DISCOVERED PETROLEUM INITIALLY-IN-PLACE

- DIIP, “estimated, as of a given date, to be contained in known accumulations prior to production”. May be:
 - Commercial: Reserves
 - Sub-Commercial: Contingent Resources
 - Unrecoverable
- Must be in **“known accumulation”**

KNOWN ACCUMULATION (PRMS)

- Accumulation: “an individual body of petroleum-in-place.”
- “... penetrated by a well that has established through testing, sampling, or logging the existence of a significant quantity of recoverable hydrocarbons.”

KNOWN ACCUMULATION (COGEH)

- “... penetrated by a well.”
- “... well must have demonstrated the existence of hydrocarbons by flow testing.”
- “However, where log and/or core data exist, and there is good analogy to a nearby and geologically comparable accumulation, this may suffice.”

ISSUES: KNOWN ACCUMULATION

- For an unconventional resource, what is:
 - “an individual body”
 - a “significant quantity”
 - “recoverable hydrocarbons”, how much, under what conditions, what process, when?
 - a “good analogy”
 - “nearby”
 - “geologically comparable”?

ISSUES: KNOWN ACCUMLATION

- Is laboratory work sufficient?
- Is log analysis sufficient?
- What weight should be put on simulation?
- Is it “known” if drilling and testing is still required?

ISSUE: TIMING

- Often lots of wells to establish in-place volumes but it may be one or two years before flow information (e.g. pilot tests) is available
- Until test information available, classify as:
 - Undiscovered?
 - Unrecoverable?
 - Contingent (on drilling, test results)?

RESERVES

- Same criteria as “conventional” resources, but;
- May be more “loosely” applied for unconventional resources:
 - Analogs
 - Extrapolation

CONTINGENT RESOURCE (PRMS)

- “... potentially recoverable from known accumulations by application of development projects”
- “...not currently considered to be commercially recoverable”
- “... due to one or more contingencies” (also COGEH)
 - “... economic, marketing, legal, environmental, social, and governmental factors”

- *“potentially recoverable from known accumulations:*
 - using established technology or technology under development, but
 - not currently considered to be commercially recoverable due to one or more contingencies”.
- “... discovered recoverable quantities associated with a project in the early evaluation stage.”

ISSUES: CONTINGENCIES

- Non-technical contingencies:
 - Guidance probably adequate
- Non-technical contingencies:
 - Guidance not adequate to capture the range of uncertainty:
 - Contingent on:
 - Successful test?
 - Development of technology?



TECHNOLOGY UNDER DEVELOPMENT (COGEH)

- “technology that has been developed and verified by testing as feasible for future commercial applications to the subject reservoir”
- Not defined under PRMS

ISSUES: TECHNOLOGY UNDER DEVELOPMENT

- Lack of clarity, ability to differentiate levels of development
- Established technology in not, or poorly, analogous reservoir, e.g.:
 - SAGD in carbonates
 - Barnett shale completions in other shales
- New technology, e.g.:
 - THAI, Electrothermal processes for bitumen
 - In-situ thermal cracking of oil shale kerogen
- Blue sky:
 - Methane hydrate
 - In-situ bacterial upgrading
- Laboratory work only?

EXAMPLE: BARNETT SHALE

"There was a time you all were told that any of the 17 counties in the Barnett Shale play would be just as good as any other county," McClendon said. "We found out there are about two or two and a half counties where you really want to be."

-- Bloomberg News October 14, 2009

EXAMPLES

- North American OilSands:
 - Two independent estimates, one four times the size of the other.
- Other Non-Public Examples

UNRECOVERABLE RESOURCES

- Not all the same
- Residual hydrocarbons
- Technology:
 - None at the present time
 - Experimental
 - Existing but not for a specific reservoir ...
- Economics:
 - Needs \$100/bbl, \$500/bbl ...
- Etc.

ACTION

- Review of PRMS Classes
- Guidance (PRMS, COGEH) that:
 - Promotes consistency
 - Sufficiently detailed to distinguish levels of uncertainty
- Governance process to deal with emerging issues, provide guidance



HOW TO CONTACT DAVID ELLIOTT

David Elliott, Ph.D., P. Geol.
Chief Petroleum Advisor

Alberta Securities Commission
4th Floor, 300 – 5th Avenue S.W.
Calgary, Alberta Canada
T2P 3C4

Tel: 403.297.4008

Fax: 403.297.2082

david.elliott@seccom.ab.ca

www.albertasecurities.com