

RESOURCES OTHER THAN RESERVES GUIDELINES

Dr. David C. Elliott

OUTLINE

2

- BACKGROUND
- RESOURCES OTHER THAN RESERVES (ROTR)
GUIDELINES
 - ▣ Contents
 - ▣ Describing your project
- ROTR WRAP-UP: Outstanding issues

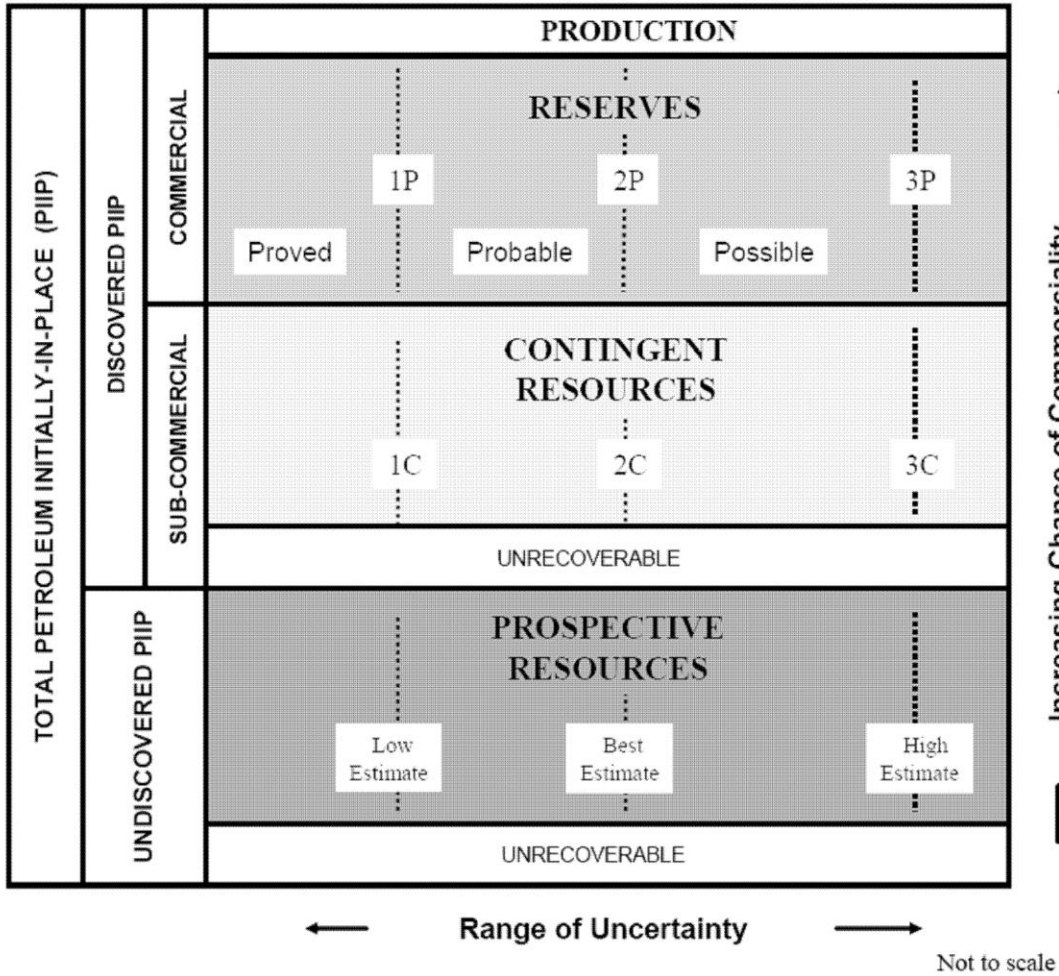
CONFIDENCE

3

- The ability to raise funds and decide on investments for oil and gas activity depends on many factors
- The factor that is within our control is the ability to provide consistent and unbiased information on oil and gas resources
 - ▣ Confidence in contingent and prospective resources currently limited

PRMS CLASSIFICATION

4



CLASSIFICATION

CATEGORISATION

THE CHANGING RESOURCE BASE

5



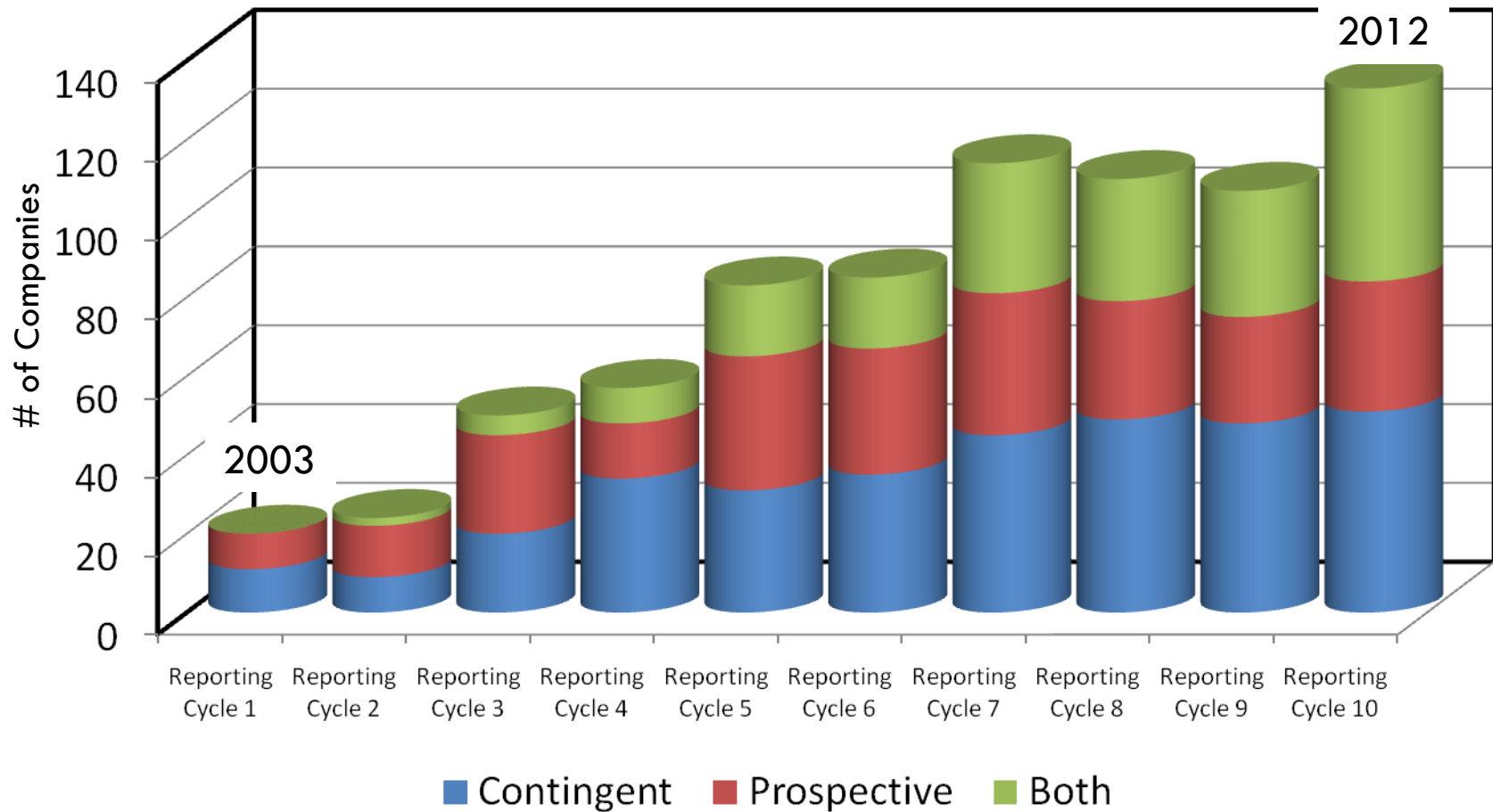
RESOURCE TYPES

6

| RESOURCE TYPE | | COMMON NAME | TRAPPING | STORAGE | STIMULATION ? |
|-----------------------|---|---|---|-------------------|--------------------|
| CONVENTIONAL | | API oil types Natural Gas Natural Gas Liquids | Buoyancy/Seal | Pores & fractures | No |
| UNCONVENTIONAL | Low permeability gas ¹ (Tight Gas) | Basin Centred gas Tight gas | Buoyancy/Seal but may be other factors | Pores & fractures | Yes |
| | | Shale gas | Adsorption on kerogen, in pores & fractures | | Yes |
| | Low Permeability oil (Tight Oil) | Tight Oil | Buoyancy/Seal but may be other factors | Pores & fractures | Yes |
| | | Shale oil | Uncertain | Pores & fractures | Yes |
| | Oil sands /carbonates | Bitumen | High viscosity | Pores & fractures | Yes |
| | Oil shale | Oil shale | Kerogen | | Pyrolysis |
| | Coal Bed Methane (CBM) ⁸ | | Adsorption in coal micropores, fractures | | Yes |
| | Underground Coal Gasification (UCG) | | Not relevant | | In-situ generation |
| | Methane Hydrates | | Water (ice) clathrates | | Yes |

MORE COMPANIES USING OPTION TO DISCLOSE CONTINGENT & PROSPECTIVE RESOURCES

7



COGEH AND NI 51-101

8

- NI 51-101 is Canadian Oil and Gas disclosure legislation
 - ▣ Refers to COGEH for technical standards of evaluation and disclosure
- Canadian Oil and Gas Evaluation Handbook (COGEH)
 - ▣ Initially published in 2002
 - ▣ Now 3 volumes
 - ▣ Periodic updates

ASC REQUEST FOR IMPROVED GUIDELINES

9

- Letter August 2010 from ASC to SPEE Calgary
 - ▣ Inconsistency in contingent resource evaluation and disclosure
 - ▣ Concern about losing credibility
 - ▣ Request to SPEE to provide improved guidelines
- SPEE Resources Other Than Reserves (ROTR) sub-committee
- ROTR Guidelines published mid-2014, available from:
 - ▣ SPE Canada, included in COGEH Vol. 2
 - ▣ [Sproule \(ROTR\)](#) as a standalone document until June 30 2015

ROTR GUIDELINES CONTENTS

10

Preface

Key Points

1. Introduction
 2. General Requirements for Classification of ROTR
 3. Petroleum Initially-In-Place (PIIP)
 4. Projects
 5. Contingent Resources
 6. Discovered Unrecoverable PIIP
 7. Prospective Resources
 8. Aggregation
- Supplementary Glossary

DEFINITION OF A RESERVOIR

11

- Old. A *porous and permeable* subsurface rock formation that contains a *separate accumulation of petroleum that is confined by impermeable rock or water barriers* and is characterized by a *single pressure system*.

- *Not always:*
 - ▣ *Porous and permeable*
 - ▣ *Separate and confined*
 - ▣ *A single pressure system*

- New. A subsurface rock unit that contains an accumulation of petroleum.

DISCOVERY

12

- New: *The confirmation of the existence of an accumulation of potentially recoverable petroleum.*
- What is “*Potentially recoverable*”, will vary with the user.

KNOWN ACCUMULATION: OLD

- *An accumulation that has been penetrated by a well. In general, the well must have demonstrated the existence of hydrocarbons by **flow testing** in order for the accumulation to be classified as “known”. However, where log and/or core data exist, and there is a **good analogy to a nearby and geologically comparable known accumulation**, this may suffice.*

KNOWN ACCUMULATION?

14

- *“flow testing”*: may not be available for years
- *“good analogy”*: relatively clear for conventional reserves, not so for ROTR
- *“nearby”*: proximity is not a good measure of geological comparability
- *“geologically comparable known accumulation”*: no guidance on this
- *“may suffice”*: not at all clear what “may” means.

KNOWN ACCUMULATION: NEW

15

- ... **penetrated by a well** that has demonstrated the existence of potentially recoverable petroleum, where:
 1. demonstrated the existence of moveable petroleum by **flow testing**, or,
 2. Where there is no flow test, if **log and/or core data exist, and there is a good commercial analogue** that supports an assumption of the existence of moveable petroleum, or,
 3. **Where log and/or core data demonstrate the existence of an accumulation for which recovery potential can only be justified through extensive testing or experimental technology, this may suffice to permit classification of the associated PIIP as “discovered unrecoverable” until a technically viable recovery technology can be demonstrated.**

ANALOGUES

16

- The transfer of information from a source (analogue) to a target or subject reservoir
- Current guidance mainly for reserves
 - ▣ Fields at “*at a more advanced stage of development or production history*”
- Limited analogous information for ROTR
- Analogues for ROTR may not be “*at a more advanced stage*”, but still provide useful information.

ANALOGUES Cont.

17

- Representative nature
- Completeness
- Scale:
 - ▣ Local wellbore?
 - ▣ Wider area?
- Components:
 - ▣ Reservoir
 - ▣ Recovery process

DESCRIBING YOUR PROJECT

18

- Property
- Project Evaluation Scenario
- Project Evaluation Status
- Recovery Technology
- Project Maturity
- Contingencies
- Resource Estimates
- Economics
- Additional information

PROPERTY AND PROJECT DESCRIPTION

19

- Property
 - ▣ Location
 - ▣ Geological target
 - ▣ Type of hydrocarbon
 - ▣ Etc.
- Project
 - ▣ Number and timing of wells
 - ▣ Recovery technology
 - ▣ Timing of production
 - ▣ Costs
 - ▣ Potential market
 - ▣ Etc.

PROJECT EVALUATION STATUS

20

□ CONCEPTUAL

- ▣ Initial stage, limited data and project details.

□ PRE-DEVELOPMENT

- ▣ More detail, enough to continue assessment, not enough for development decision

□ DEVELOPMENT

- ▣ Detailed, provides information for decision on development (Final Investment Decision)

RECOVERY TECHNOLOGY

21

- ESTABLISHED TECHNOLOGY. ... proven to be successful in **commercial** applications.
- TECHNOLOGY UNDER DEVELOPMENT A field test to determine the **economic viability** of a recovery process for the subject reservoir.
- EXPERIMENTAL TECHNOLOGY A field test to determine the **technical viability** of a recovery process for the subject reservoir.

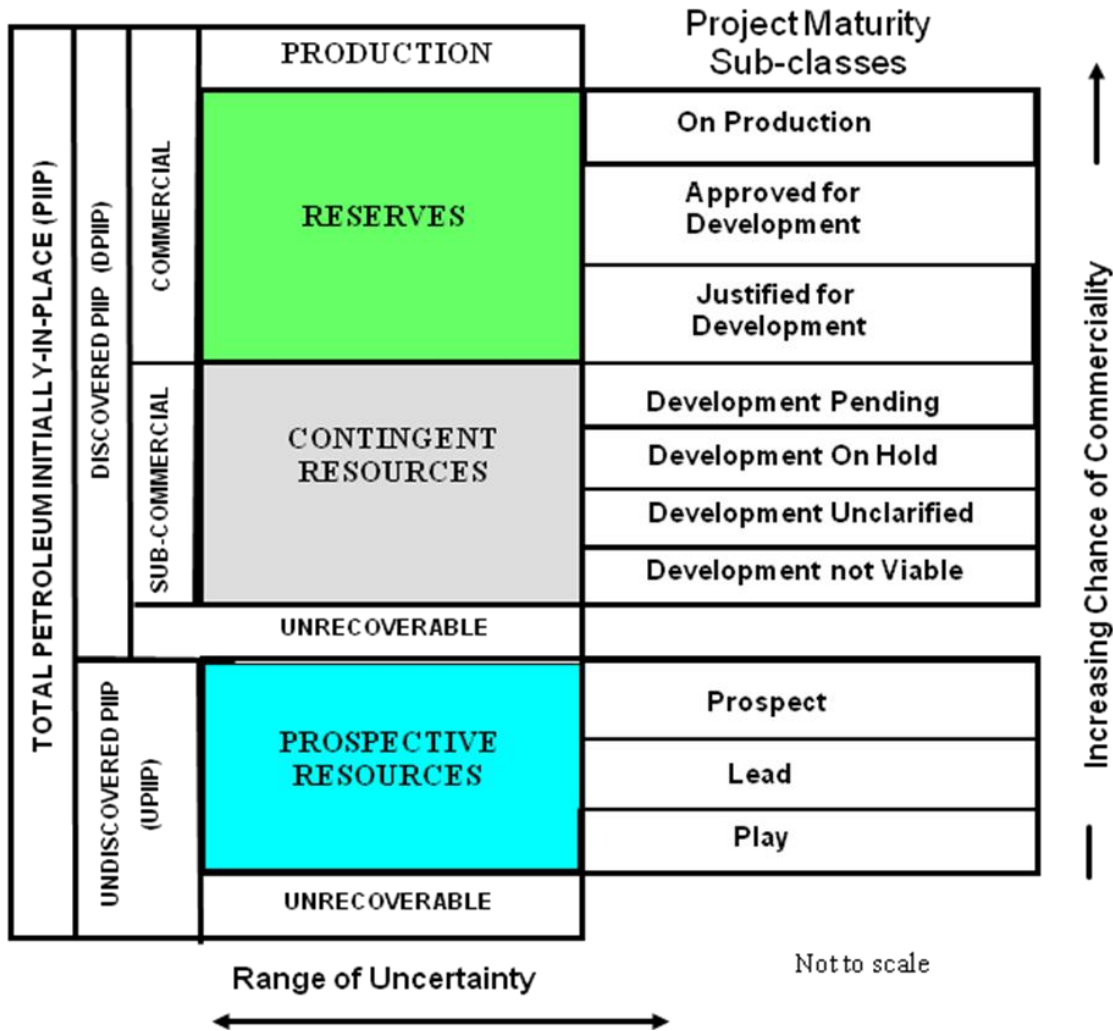
PILOT TEST AND SCALING

22

- PILOT TEST. A small-scale test or trial operation that is used to assess the suitability of a method for commercial application (COGEH and PRMS).
 - Generic description that does not clearly indicate the stage of the recovery technology.

- SCALING
 - Technology Under Development may need to be scaled up to confirm economic viability
 - This scaling is for the recovery process, and only for the area of the TUD
 - Extrapolation over a larger area depends on other factors

PROJECT MATURITY SUB-CLASSES



Modified after PRMS

PROJECT MATURITY STATUS From PRMS

24

- DEVELOPMENT UNCLARIFIED
 - ▣ evaluation is incomplete and there is ongoing activity to resolve any risks or uncertainties.

- DEVELOPMENT PENDING
 - ▣ resolution of the final conditions for development is being actively pursued, no known contingencies (high chance of development).

- ON HOLD
 - ▣ reasonable chance of development but major non-technical contingencies that are usually beyond the control of the operator.

- DEVELOPMENT NOT VIABLE
 - ▣ where no further data acquisition or evaluation is currently planned and hence there is a low chance of development.

TIME AND ACTIVITY LEVEL

25

- Development Unclarified and Development Pending
 - ▣ Cannot be maintained indefinitely
 - ▣ Requires activity to resolve
 - ▣ Reclassify if no activity over an unduly extended time for the project
- On Hold
 - ▣ No time or activity requirement BUT
 - ▣ Report the current situation

ECONOMIC vs COMMERCIAL

26

- Economic
 - ▣ Positive NPV at a selected hurdle discount rate

- Commercial
 - ▣ Economic and
 - ▣ No contingencies that prevent production and sale

- Reserves must be COMMERCIAL

CONTINGENT RESOURCE

27

- ... those quantities of petroleum ... potentially recoverable from known accumulations using established technology or technology under development, but which are not currently considered to be commercially recoverable due to one or more contingencies.

- **CONTINGENCY** A condition that must be satisfied for a portion of Discovered Petroleum Initially in Place to be classified as a Reserve that is:
 - Specific to the project being evaluated, and,
 - Can be expected to be resolved.

CONTINGENCIES

28

- TECHNICAL
 - ▣ Technology under development

- ECONOMIC STATUS
 - ▣ Economic (PRMS Marginal)
 - ▣ Sub-Economic (PRMS Sub-marginal)
 - ▣ Undetermined (Maturity sub-class Unclarified)

- NON-TECHNICAL
 - ▣ Legal, Regulatory approval, Access to Markets
 - ▣ Political, Social licence?
 - ▣ Etc.

AGGREGATION

29

- Aggregation of individual prospects into an exploration portfolio
- Aggregation of individual well estimates to the property level
- Aggregation across resource classes
 - Potentially very misleading
 - Not allowed in NI 51-101

ROTR WRAP UP

30

- ROTR items we didn't have time to develop fully:
 - ▣ Extrapolation from a control point.
 - ▣ Analogues
 - ▣ Catalogue of Recovery Technologies
 - ▣ Aggregation
 - ▣ Social licence

WRAP UP: COGEH GENERAL

31

- Update process
 - ▣ Emerging Issues Committee
 - ▣ Digital, dynamic
- COGEH Maintenance
 - ▣ Update and integration of additional sections
 - ▣ Glossaries
 - ▣ Resource specific guidelines
 - Update existing resource specific guidelines (CBM, Bitumen)
 - New resource specific guidelines (Low permeability oil and gas reservoirs (clastics, shales, silts, mudrock; carbonates)).

WAYS AND MEANS

32

- Manpower
 - ▣ SPEE Calgary has fewer than 50 members
- Financing
 - ▣ Only from sale of COGEH

MISC

33

- COGEH Training courses
- COGEH Advisory Committee

REMEMBER THE OBJECTIVE

34

- Provide information to be able to make investment decisions with confidence