Course title: Exploration Economics, Risk Analysis and Prospect Evaluation

About this 5 day course
The prospect maturation process, from a lead to a drillable prospect, is at the heart of the exploration business. This course will cover all aspects of the prospect maturation process: play understanding in the context of regional geological understanding; detailed prospect evaluation; realistic risk & volume assessment consistent with the play understanding and prospect details, and an introduction to exploration economics. Throughout the course there is a strong focus on pragmatic (geo)logical approach for assessing those aspects that are input parameters for a meaningful assessment of prospect risks and volumes, with emphasis on a balanced integration of contributions from different sub-surface disciplines. In addition, an introduction of unconventional gas will be given with emphasis on the differences between conventional and unconventional gas and the implications for evaluation of prospects.

What this course will cover in 5 days
This course describes the various aspects that need to be considered in the prospect maturation process, including:

- Play development in the context of a sound understanding of the regional geology
- Detailed prospect evaluation and understanding of the critical aspects of traps, reservoirs, seals and charge
- Examples from plays and prospects in different basin settings from around the globe
- Realistic and pragmatic risk and volume assessment, based on the geological understanding of plays and prospects
- An introduction to Unconventional Gas resources, highlighting the main differences between conventional and unconventional exploration
- An introduction to exploration economics

Date, Duration: 2nd – 6th Feb 2015, 5 Days

Outline

Full Course Outline

DAY 1

Theme: Risks, Volumes and Uncertainty

Welcome
An outline of the programme, the objective of the course and participants’ goals.

Introduction
Introduction to Risk & Volume assessment: the main concepts and discussion of how the results of risk & volume assessments are used in the business

Risks, Volumes and Uncertainty
The difference between risk and uncertainty, basics of essential statistical concepts, the
play elements and workflow to assess prospect risks, biases in estimating uncertainties, the results of probabilistic volume assessments and their representation in expectation curves and frequency plots, exercises to enhance understanding of introduced concepts

Prospects and Plays

Play maps and demonstration of how understanding of the regional geology, petroleum systems and hydrocarbon plays is an essential element in the assessment of risks & volumes for individual prospects, exercises on the use of play maps for risk assessment

Traps

Risks and uncertainties associated with hydrocarbon traps, the difference between spill and leak points, how to deal with sealing faults and overpressures, how to calculate gross rock volumes and how to estimate realistic uncertainty ranges for hydrocarbon column length, exercises

Summarising the day

Close

DAY 2

Theme: Traps and Reservoirs

Reflections on Day 1

Re-cap of insights gained

Stratigraphic Traps

Main risks of stratigraphic traps, and conditions under which stratigraphic traps work best. How to risk stratigraphic traps, and effect of thinning reservoirs with uncertain column length on gross rock volume calculations.

Traps in important hydrocarbon settings

Examples of trap types in rifts, passive margins, deltas, carbonate provinces, deep water settings and stratigraphic traps, as well as their typical characteristics and risks

Reservoirs

Risks and uncertainties associated with reservoir rocks, how to deal with layered reservoirs, waste zones and irregularly shaped reservoirs, facies and depth trends in reservoir characteristics, exercises

Carbonate reservoirs
Carbonate depositional models and reservoir facies, platform carbonates and reef settings, importance of diagenetic history for carbonate reservoirs, gross and net/gross considerations

Summarising the day

Close

DAY 3

Theme: Seals and Pressures

Reflections on Day 2

Re-cap of insights gained

Carbonate reservoirs

Reservoirs in rifts, passive margins, deltas, carbonate provinces and deep-water settings, and their typical characteristics and risks

Seals

Mechanisms of seal failure, how to deal with leaky seals and differential leakage of gas, exercises to enhance understanding

Pressures and overpressures

What can reservoir pressure data tell us, overpressures and impact on seal risk and column length prediction, exercises to enhance understanding

Seals and pressures in important hydrocarbon settings

Seals and pressures in rifts, passive margins, deltas, carbonate provinces and deep-water settings, and their typical characteristics and risks

Summarising the day

Close

DAY 4

Theme: Charge, Risks and Volumes

Reflections on Day 3

Re-cap of insights gained

Charge

Impact of source rock types and timing issues for charge assessment, how to deal with mixed columns (oil and gas), formation volume factors (gas expansion and oil shrinkage), hydrocarbon saturations and recovery factors, the impact of long transition
Charge in important hydrocarbon settings
Source rocks and charge in rifts, passive margins, deltas, carbonate provinces and deep-water settings, and their typical characteristics and risks

Risk & Volume assessment
Practical exercises in small groups on prospect risk assessment, and back-of-the-envelope volume calculation exercise. Group discussion on the impact of positive and/or negative geological indications for the presence or absence of play elements.

Volumes and portfolios
The impact of dependencies between prospects in a portfolio, risking and volume assessment of prospects with stacked reservoir-seal pairs, adding probabilistic prospect volumes statistically corrected.

Summarising the day
Close

DAY 5
Theme: Bringing it all Together
Reflections on Day 4
Re-cap of insights gained

Geophysical evidence
The impact on prospect POS (probability of success) of direct hydrocarbon indicators (DHIs) and/or positive (or negative) evidence form controlled source electromagnetics (CSEM) – consistent with Bayes’ theorem, exercises

Unconventional Resources
Unconventional Gas (Coalbed Methane, Basin Centre Gas and Shale Gas) and Unconventional Oil (Tar sands, Light Tight Oil). Explanation of how these unconventional resources are trapped, and the main exploration and development issues. Differences with conventional oil and gas.

Exploration economics
Basics of assessing the economic value of prospects

**Prospect Maturation**

**Workflow**

The exploration process, risk profiles and ranking of prospects, risk mitigation, scenarios in prospect assessment: when to use them and when not

Course ends

**Maximum number of participants (if applicable): 15**

**Who should attend**
This course is designed primarily for geoscientists who have been working for several years in exploration and who want to improve their expertise of the prospect maturation process and risk and volume assessment, as well as for their direct supervisors. It is also a very applicable course for staff from disciplines working closely with exploration staff: prospect portfolio analysts, reservoir engineers, petrophysicists and geophysicists.

Prerequisites if any: Geoscientists who have been working for several years in exploration

Course will be conducted in a classroom setting method, no software or computer will be used. A strong focus on geological evaluation method will be shared, focusing on hands on, practical calculation which is lacking in most courses these days.

**Daily course schedule**

**Course Outline and Schedule for 5 Days**

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