TETRA TECH RPS ENERGY | TRAINING

N406: Unconventional Resource Assessment and Valuation

Instructor(s): Creties Jenkins and Mark McLane

Format and Duration

Classroom - 4 Days
Virtual - 8 Sessions

Summary

Probabilistic techniques and a staged approach are applied to make good decisions about which projects to invest in and how to wisely spend limited capital. This is critically important, given the risks and uncertainties inherent in these plays, as well their technical complexities and limited datasets.

Business impact: This course provides the strategies, tactics, and tools needed to effectively assess and value oil and gas resource plays.

Please note this course is offered in partnership with Rose and Associates. They will deliver and provide all logistics for the course.

Learning Outcomes

Participants will learn to:

1. Use probability as a language for communicating uncertainty, including the use of log-probability plots to effectively display distributions.
2. Quantify the mean and variance of parameters such as in-place volumes, initial well rates, and ultimate recoveries.
3. Understand the key risks and uncertainties inherent in appraising and developing unconventional reservoirs.
4. Estimate the chances of geologic and economic success.
5. Understand the impact of aggregation, the use of confidence curves, and the utility of sequential aggregation plots to assess project performance.
6. Grasp the elements of probabilistic production forecasting, including the aggregation of production volumes to the project level.
7. Understand the unique practices and pitfalls of estimating resources and Reserves in unconventional reservoirs.
8. Use decision trees and value-of-information exercises to make better decisions about what data to acquire.
9. Use limited datasets and imperfect information to better quantify the range of possible outcomes.
10. Apply a stage-gate process to maximize value by assuring focus on the right risks and uncertainties at each stage.

Training Method

This is a classroom or virtual classrom comprising a mixture of lectures, discussion, exercises, and a capstone project incorporating the course concepts.

Who Should Attend

This course is intended for geoscientists, engineers, commercial team members, business analysts, and

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managers charged with creating value from their unconventional resources.

Course Content

Day 1 focuses on the key risks and uncertainties faced in assessing unconventional reservoirs and then turns to the fundamentals of probability as a means of communicating uncertainty. Day 2 begins by improving our ability to estimate under uncertainty and then applies these techniques to estimate in-place volumes and the chance of geologic success. Day 3 focuses on the principles of aggregation and applies these to production forecasting and resources & reserves estimation. Day 4 shows how decision trees and value-of-information approaches can help us, followed by discussions of how we can make better decisions with limited data and how projects should be assessed using a decision stage approach. The course concludes with a Capstone exercise that encompasses the concepts covered in the course.

Topic 1

- Introduction
  - Determinism vs. probabilism
  - Failure to attain production and value in unconventional reservoirs
  - The need for a decision-stage approach
- Work Processes and Deliverables in Unconventional Reservoirs
  - Key risks and uncertainties to consider
  - Data to gather and analyze
  - Work to undertake, associated deliverables, examples
- Probability, Distributions, and Dependencies
  - Definitions and distribution types, measures of central tendency and dispersion
  - Use of log-probability plots
  - Correlations and dependencies

Topic 2

- Estimating Under Uncertainty
  - Use of probabilistic ranges
  - Impacts and mitigation of bias
  - Making multiple independent estimates
- Estimating In-Place Volumes
  - Dealing with input uncertainty
  - Determining gas-in-place in a high-graded area (exercise)
  - Graphical, parametric, and Monte Carlo approaches
- Determining Chance of Success
  - Geologic (Pg) and economic (Pe) chance of success
  - Determining key chance elements in a tight gas reservoir (exercise)
  - Determining chance of success for a shale play (exercise)

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Topic 3

- Aggregation Principles
  - How aggregation works and its impact
  - Developing and using aggregation (trumpet) plots, confidence curves, and sequential aggregation plots
  - Modelling uncertainty around the mean initial rate (UaMIP)
- Quantifying Production Forecast Uncertainty
  - Comparison of empirical and model-based methods
  - Steps for building production type-curves
  - Quantifying forecast uncertainty
- Estimating Resources and Reserves in Unconventional Reservoirs
  - Resources other than reserves (prospective, contingent)
  - Reserves (PRMS, COGEH, SPEE Monograph 4)
  - Probabilistic methods for undeveloped reserves (SPEE Monograph 3)

Topic 4

- Decision Trees and the Value of Information
  - Coin flip value of information (game)
  - Using perfect vs. imperfect information
  - Use of Bayes theorem and examples
- Making Better Decisions with Limited Data
  - Building EUR envelopes using log-probability plots
  - Montney Shale and Permian Wolfberry reservoir exercises
- Decision Stage Assessment
  - Project stages and relevance
  - Objectives and tactics associated with each stage
  - Economic modeling and portfolio ranking

Topic 5

- Utopia Shale Capstone Exercise
  - Sweetspot mapping, petrophysics, and STOOIP estimation
  - Selection of completion techniques and production type curves
  - Using confidence curves to optimize the number of pilot wells to drill
  - Calculation of expected value and bidding for leases
  - Drilling of winning team's wells and exercise debrief