TETRA TECH RPS ENERGY | TRAINING

# N014: Petroleum Economics and Risk Analysis

Instructor(s): Mark Cook

**Format and Duration**

Classroom - 5 Days
Virtual - 5 Sessions

## Summary

This course details the main financial concepts and economic evaluation techniques and related financial concepts that are used in the oil and gas upstream business to assist decision making. The course will focus on the conversion of hydrocarbon volumes to 'monetary value' and the requirement for consistent means of determining the attractiveness of investment opportunities through the field lifecycle. Portfolio decision making will also be discussed.

**Business Impact:** This course will provide attendees with methods to identify and incorporate **subsurface**, **facilities**, **and commercial uncertainties** into an **economic evaluation** of a project. Additionally, it will provide practice with tools to **manage the associated risks**, thereby **reducing the investor's exposure to financial downside** while **taking advantage of potential upside**.

## Learning Outcomes

Participants will learn how to:

1. Employ the principal elements and techniques of petroleum economics.
2. Analyse wider trends that determine worldwide hydrocarbon reserves, supply and demand pressures, and forecast trends for the future.
3. Illustrate how petroleum economics is critical to the project decision-making process.
4. Analyse the nature of discounted cash flow, Net Present Value, Rate of Return indicators, and the Cost of Capital.
5. Demonstrate how Profitability and Efficiency are measured for a project, including the role of inflation.
6. Distinguish the various Petroleum Fiscal Systems in operation around the world (tax and royalty-based, PSC's).
7. Examine more fully how projects are screened and ranked economically.
8. Perform sensitivity analysis, Monte Carlo simulation, and decision tree analysis.
9. Apply quantitative risk analysis tools, such as the Bow Tie model, to identify and manage project risk and to capture actions on a risk register.
10. Understand the risk management benefits of building a portfolio of E&P assets.

## Training Method

This is a classroom or virtual classroom course comprising a mixture of lectures, discussion, case studies, and practical exercises involving the use of bespoke software tools. For virtual classroom courses, participants are required to complete some of the course exercises between the live sessions.

## Who Should Attend

E&P professionals of all disciplines (including geoscientists, engineers, and managers) who wish to obtain

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an understanding of petroleum economics and risk analysis, and those who are transferring from a technical discipline into the world of commercial evaluation.

## Course Content

### Introduction

- The global oil and gas industry; distribution of reserves; world supply and demand; trends for the future including the influence of renewable energy sources
- The role of petroleum economics in decision making

### Development Economics

- The input required for constructing a project cash flow
- Principles of cash flow analysis
- Constructing the project cash flow (exercise)
- Indicators from the undiscounted project cash flow (exercise)
- Petroleum Fiscal Systems; tax and royalty, Production Sharing Contracts
- The principles of discounting
- Discounted cash flow (exercise)
- Indicators from the discounted cash flow (NPV, IRR)
- Use and abuse of EXCEL to calculate NPV, IRR
- Calculating the cost of capital (weighted average cost of capital)
- Profitability indicators and efficiency ratios (exercise)
- Project screening and ranking (exercise)
- Incorporating inflation into the project economics
- Understanding real terms, money of the day (MOD), Internal Real Rate of Return
- Sensitivity analysis and spider diagrams (exercise)

### Incremental Economics

- Analysis of incremental project economics; alternative methods
- Operational decision making (exercises)

### Risk and Uncertainty Analysis

### Defining Uncertainty and Risk; Statistician's vs Practitioner's View

- Identifying relevant parameters that exhibit uncertainty
- Expressing uncertainty as probability distributions with basic statistics
- Distribution types (normal, triangular, log-normal, etc.,)
- Combining uncertainties; Monte-Carlo methods
- Getting to know TRACS MCApp (or @RISK) for Monte Carlo simulation (exercise)

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## Exploration Economics

- Understanding and incorporating exploration risk (case-study based exercise)
- Exploration risking and expected monetary value EMV (exercise)
- Decision tree analysis
- Use of MCApp to create P90, P50, P10 estimates
- Combining continuous distributions with decision tree analysis

## Economics of Appraisal

- The objectives of appraisal; Value of Information (VOI) concepts
- Appraisal planning for added value (exercise)

## Heuristics - Human Bias in Uncertainty Estimation

- Identifying and managing human bias - results from psychological studies

## Risk and Uncertainty in Development Planning

- Causes and consequences - the Bow Tie Model (exercise)
- Managing risk - the risk register and action plan (exercise)
- Development concept selection and the concept select matrix

## Portfolio Management

- Portfolio theory
- Portfolio benefits in an E&P context