Project Management, Risks and Decision Analysis

Instructors: Dr. Reidar Bratvold
Level: Basic-Intermediate
Duration: 5 days

Course Description
This course provides participants a practical, hands-on approach to modern techniques in petroleum risk management and decision-making with a focus on upstream oil & gas projects. The key concepts for risk-based evaluation, planning and decision making in upstream projects will be extensively illustrated and discussed. The techniques presented are applicable to all aspects of petroleum exploration and production - prospect evaluation, resource allocation, diversification, risk sharing, and corporate planning. This course helps participants develop problem solving, leadership and functional skills necessary to manage the modern petroleum enterprise. It is well suited for new hires and/or professionals with less experience in the oil industry. Course participants will find the concepts and techniques stimulating and beneficial - enabling them to apply risk and decision making concepts to their jobs immediately.

The course is conducted in workshop format that combines lectures, case studies, group work and individual study. Ample examples and hands-on exercises with commercial software Palisade Suite along with Microsoft Excel with add-ons for decision tree and Monte Carlo simulation will be used both in the lectures as well as in the practice sessions to address practical decision problems to enhance and solidify the learning experience of participants. Instructor’s book on “Making Good Decisions” will be used in the course along with customized power point presentations. Participants will receive a copy of the book and related course manual.

Outcome and Benefits of Course
By the end of the course participants will feel confident in your understanding of:
- Decision and risk analysis concepts & terminology relevant for upstream oil & gas decisions.
- The application of a multi-objective, value-creating approach to decision-making.
- The impact of uncertainty and risk in E&P decision-making.
- The value of making sound portfolio management decisions.
- Specific tools & processes for analyzing & making decisions including decision trees (PrecisionTree from Palisade) and Monte Carlo simulation (@RISK from Palisade).
- How to use these tools & processes in Excel.
- How people often actually make decisions as opposed to how they should.

Who Should Attend
An engineer of any discipline, a geoscientist, petrophysicist or technologist with 1-5 years experience who directly or indirectly applies risk and decision making concepts in all aspects of petroleum exploration and production. Manager who are involved in developing onshore E&P projects
Topics Covered

- Introduction
- Foundation of economics for the upstream business
- Risk and uncertainty identification and quantification
- Applications of decision and risk analysis to upstream oil & gas decisions
- Modelling and structuring complex and uncertain upstream oil & gas decisions
- Decision analysis - utilising decision trees
- Value of information concepts and its application
- Monte Carlo simulation and the value of sensitivity analysis
- Portfolio analysis and management with multiple objectives
- Behavioural challenges in decision making

About the Instructor

Dr. Bratvold is Professor of Petroleum Investment and Decision Analysis at the University of Stavanger and at the Norwegian Institute of Technology where he is teaching and supervising graduate students doing research in decision analysis, project valuation, portfolio analysis, real-option valuation and behavioral challenges in decision-making.

Prior to academia, he spent 15 years in the industry in various technical and management roles including as Vice President in Landmark Graphics Corporation in Houston, Managing Director of Smedvig Technology Software Solutions (now Roxar), Senior Scientist with IBM, and Reservoir Engineer with Statoil. He spent his early working years as a roughneck and roustabout in the North Sea.

Dr. Bratvold has published numerous papers on topics such as investment modelling, decision-making, stochastic reservoir modelling, fuzzy logic and reservoir management. He is a co-author of the SPE book Making Good Decisions.

He has three times served as an SPE Distinguished Lecturer. He is the 2015 recipient of the North Sea Region SPE Management & Information award and was recently appointed as the executive editor for the SPE Economics & Management journal. He is a Fellow in the Society of Decision Professionals and the Norwegian Academy of Technological Sciences.
Table of Contents of the Course

1. Introduction
   - Course Objectives
   - Course Overview

2. Decision Making
   - Motivation
   - Key Concepts
   - Exercise 1: Let’s make a decision

   - Foundations of economics for upstream business
   - Development of Cash Flow Models
   - Decision metrics (NPV, IRR, IE)
   - Break-even analysis
   - Exercise 2 –
     - Part 1: Develop simple cash flow model for development decision
     - Part 2: Calculate decision metrics including NPV, IRR and PO
     - Part 3: Conduct break-even analysis

4. Probability Review
   - Uncertainty and Risk
   - Probability as a degree of belief
   - Probability updating – Bayes’ theorem with applications
   - Probability distributions
   - Exercise 3: Using Bayes’ rule to update probability assessments with new information

5. Structuring, Modeling and Solving for Best Option
   - Foundations of economics for upstream business
   - Development of Cash Flow Models
   - Decision metrics (NPV, IRR, IE)
   - Break-even analysis
   - Exercise 4 –
     - Part 1: Structuring decisions
     - Part 2: Calculate expected value
     - Part 3: Conduct sensitivity analysis
   - Case study 1: Wildcat drilling

6. Value of Information
   - Structure
   - Examples
   - What’s required for information to add value?
   - Common traps and pitfalls
Exercise 5
- Part 1: Structuring Value of Information (VOI) problems
- Part 2: Calculate value of perfect and imperfect information

Case study 2: Schellburger Oil – Invest to improve the information quality?

Monte Carlo Simulation
- Defining the model
- Defining input distributions
- Sampling input distributions
- Interpreting and using the results
- The flaw of averages
- Exercise 6: Monte Carlo Simulation
  - Part 1: Profit simulation
  - Part 2: Reserves estimation and the Central Limit Theorem
  - Part 3: Correlated sampling
  - Part 4: The flaw of averages
- Case study 3: Monte Carlo Simulation and uncertain cashflows
- Building project models and generating cash flows
  - Volumes
  - Reserves
  - Production
  - Price and costs
  - Cash flows with confidence intervals
  - Project valuation

Portfolio modeling, analysis and management
- What, why, how?
- Principles
- Diversification
- Systematic vs non-systematic risk
- Ranking
- Modeling and analysis techniques
- Exercise 7: Portfolio ranking
  - Part 1: Bang-for-Buck ranking
  - Part 2: Diversification and the Central Limit Theorem
- Multi-objective optimization
- Exercise 8: Portfolio ranking
  - Part 1: Probabilistic aggregation
  - Part 2: Portfolio decision displays

Risk Attitude
- Risk averse, risk neutral, and risk seeking
- Risk attitude consequences
- Exercise 9: Risk attitudes
  - Part 1: What is the risk premium for a given level of risk aversion?
  - Part 2: Value of information for a risk averse decision maker.
10. Behavioral Challenges in Decision-Making
   - How we know what isn’t so
   - Human biases

11. Wrap-up: Key Take-Aways

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The blue text refers to chapters in the course book Making Good Decisions

Dr. Reidar Bratvold (IPS, Inc.)