

3 Day Course - Advanced Oil & Gas Economics

Target Audience: Petroleum Executives and Professionals (Petroleum Engineers)

Instructor: Dr. Ruud Weijermars – TU Delft/ Alboran Energy Strategy Consultants

Course design

Economics for oil and gas projects under conditions of certainty and uncertainty. The subjects treated are petroleum economics, project evaluation and corporate finance.

Course philosophy

Petroleum professionals need to have a thorough understanding of the value chain and the global competitive landscape in which they operate. This course provides that deeper understanding, covering both the strategic and operational aspects. Instructive case studies illustrate the concepts discussed and brief workshops help consolidate the acquired insight.

Executives and Petroleum Engineers must be able to understand the financial performance of oil and gas investments from both the project and corporate performance perspectives. Oil and gas professionals need to have a basic knowledge of Capex, Opex, time value of money, discounted cash flow analysis, and financial decision-making under uncertainty. The generic cash flow curve of oil and gas projects is well known. However, the new area of tougher petroleum economics requires a more integrated approach where the economic analysis is moved forward in the E&P lifecycle.

The landscape is different for each type of company or business unit. For example, NOCs need to factor into their business model the cost of community services, while IOCs are under pressure to optimize total shareholder returns. NOCs that make the transition to become international operators must merge the “two cultures” in order to successfully compete with the IOCs in the international arena. Service companies and business units dedicated to services must innovate their tools and methods faster and faster in order to keep pace with the changing needs of the new assets targeted by their client companies. All these new activities require an economic validation. The assets and services that petroleum operators explore and develop need to remain profitable.

Topics covered include: petroleum economics, working capital, cash flow, time value of money, expected monetary value, project profitability and costs, probability density functions, reserves analysis, production forecasting, portfolio optimization, and uncertainty modelling, KPIs (market cap, profitability, gearing, credit rating, reserves), asset valuations, project portfolios & cash flow challenges, global & regional players (markets), supply/demand balance, major producers (primary production & recycling), major consumers, commodity pricing mechanisms, traders & analysts, agency forecasts, discounted cash flow basics, project EMV, project NPV & IRR, costing OPEX and CAPEX, taxation and royalties, price fluctuations & hedging, sensitivity analysis, resource appraisal (TRR, ERR, EUR), reserve classification (UNFCR, PRMS) & maturation, prudent financial management, cost of capital (WACC), acquisitions & Valuations, portfolio theory, risk Management

Learning outcomes: Understand the financial performance of oil & gas investments from both the market, project and corporate performance perspectives.

Instructor Bio

Ruud Weijermars conducts original research in energy strategy, petroleum economics, and geomechanics—integration of these disciplines is required to optimize fossil fuel recovery. He is associate professor at Delft University of Technology, where he heads the Unconventional Gas Research Initiative (UGRI; <http://ugri.tudelft.nl/>) and a consulting research associate of the Bureau of Economic Geology, University of Texas at Austin. He is principal partner at Alboran Energy Strategy Consultants (<http://alboran.com>) and editor-in-chief of Energy Strategy Reviews, a scholarly journal published by Elsevier (<http://www.journals.elsevier.com/energystrategy-reviews/>).



Course Outline:

1. Global Context – The Competitive Business Environment

A company's oil and gas production output and reserve base can grow organically, by acquisition, joint ventures or mergers. At the end of the day, optimization of the underlying asset is the task of petroleum engineers. They must understand the global trends, challenges and opportunities in order to know where the competitive edge moves to. Who are the industry leaders and why? What do forecasts say about the future business landscape and solutions? This knowledge helps the petroleum professional in the search for better reservoir development solutions.

Gas Trades

- Global Markets
- Competition between LD Pipelines, LNG and regional production

Oil Trades

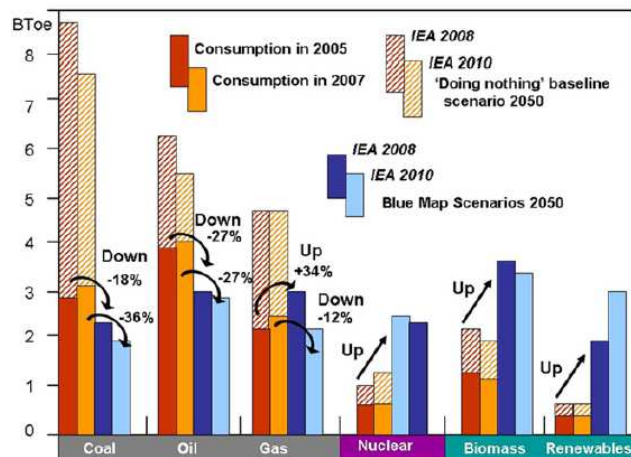
- Global Markets
- Interfuel competition

Scenarios & Trends

- NOCs & IOCS
- Agency Forecasts

Corporate Players

- Shale Independents
- Merger & Takeover Trends



2. Geological Resources – The Competition for Access to Finite Resources

Upstream oil and gas production, exploration and development services remain the principal sources of growth for today's oil companies. The lifecycle of hydrocarbon resources is finite, which means companies must continually find and secure access to new prospects. The major geological settings of hydrocarbon resources are reviewed. Today's major field development regions are highlighted. Each play type poses certain development challenges and requires in-depth knowledge in certain technology areas. For example, tight reservoirs require hydraulic fracturing expertise, subsalt plays require a thorough understanding of salt tectonics, and deep-water drilling targets require expert understanding of formation pressures and well control. The ultimate aim is to establish resource potential and appraise economic value, which needs cutting-edge oil professionals who combine a broad view of the business with detailed expertise.

Geology

- Petrogenesis
- Maturation Process

Hydrocarbons

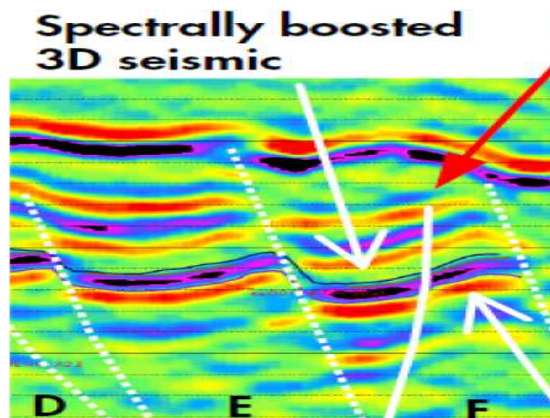
- Composition
- Reservoir Types

Reservoir characterization

- Lithofacies
- Seismic inversion

Resource Appraisal

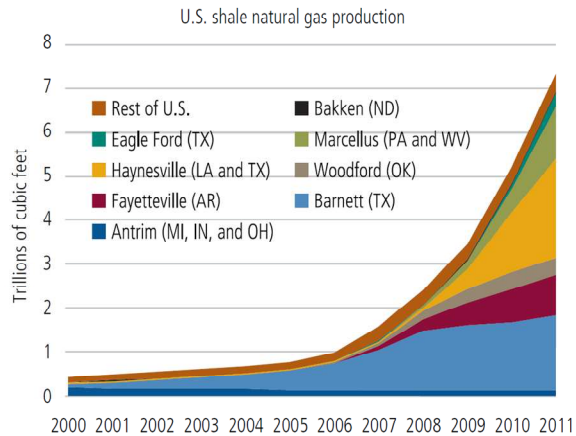
- OGIP, TRR, ERR



3. Shale Oil & Gas Potential

The new reality of shale gas economics – making a profit by averting risk and mastery of uncertainty.

- Uncertainty analysis of well productivity
- How upfront optimism can jeopardize shale projects and profits
- Discounted cash flow curves and net present value
- How stakeholder misalignment impacts field economics
- Precision fracking potential and impact on field performance



4. Cash Flow Analysis and Uncertainty in Field Development Projects

The cash flow model for each field development project requires production rate estimates, and input for CAPEX, OPEX, taxation rates, royalty rates, interest rates, discount rates. The Net Present Value (NPV) and Internal Rate of Return (IRR) determine where the project is profitable and sustainable. Petroleum professionals must understand the detailed cash flow model and the impact of project delays, hurdle rates and accelerated production.

Cash Flow Model

- Drilling Plan
- Discounted NPV

Management Accounting

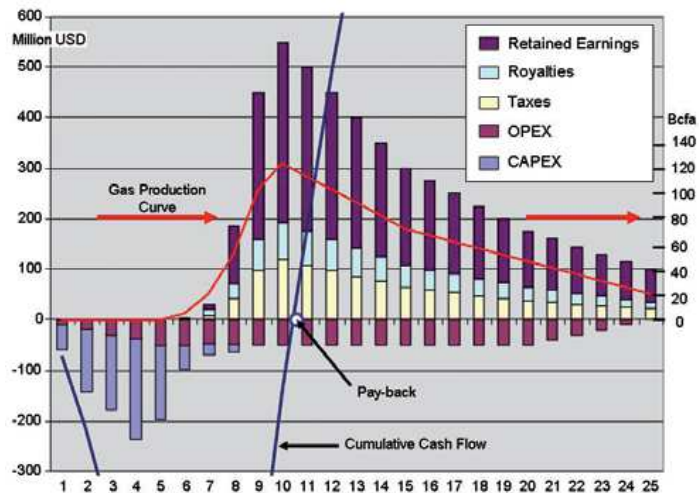
- Financing need
- Payback & IRR

Sensitivity Analysis

- Impact of Rates
- OPEX & CAPEX

Risk Exposure

- Project Delays
- Deterministic & Stochastic Uncertainty



5. Asset Growth & Evaluation & Financing Principles

Oil and gas projects are capital intensive and require huge up-front investments. The cost of capital is determined by factors such as the equity and debt-financing and the corporate credit rating. Oil companies must actively manage their cost of capital and their liquidity position determines whether they are asset net sellers or net buyers. The valuation of hydrocarbon assets requires petroleum engineering expertise. They must be able to integrate the corporate objectives with the detailed operational knowledge of the reservoir in order to properly value hydrocarbon assets.

Cost of Capital

- Debt financing
- Equity financing

Portfolio Theory

- Risk Management
- Project Returns

Acquisition

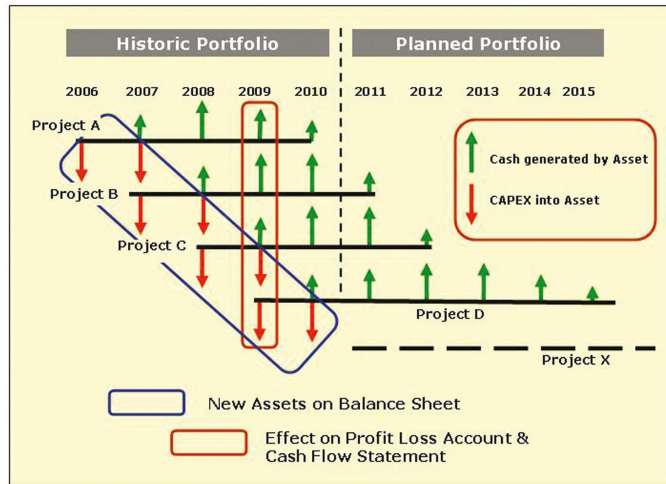
- Valuation methods
- Asset purchase

Asset Growth

- Organic Growth
- Joint ventures

6. Non-conventional Field Development Options

The legacy fields that have traditionally provided petroleum companies with easy cash from yield/low-risk projects are now rapidly depleting. Consequently, all oil and gas companies are now facing an era where risky projects are progressively making up a higher proportion of their corporate project portfolios.



high-
major

Syncrude

Oil shales

Process technology Booming unconventionals

7. Reserve Reporting – Compliance Requirements & Systems

The Petroleum Resources Management system (PRMS) is now supported by all major organizations (SPE, AAPG, WPC, SAPEE, and SEG). International oil companies must report their reserves to SEC and IEA and comply with the SEC reserves reporting guidelines. International joint ventures and asset sales require compliance with the PRMS and SEC guidelines, because otherwise the resource inventory is not established according to the required standards. Petroleum engineers must certify the reserves and therefore must understand the PRMS system and SEC new reporting guidelines.

Reserve Maturation Model

- PRMS
- Reserves & PUDs

Corporate Financial Statements

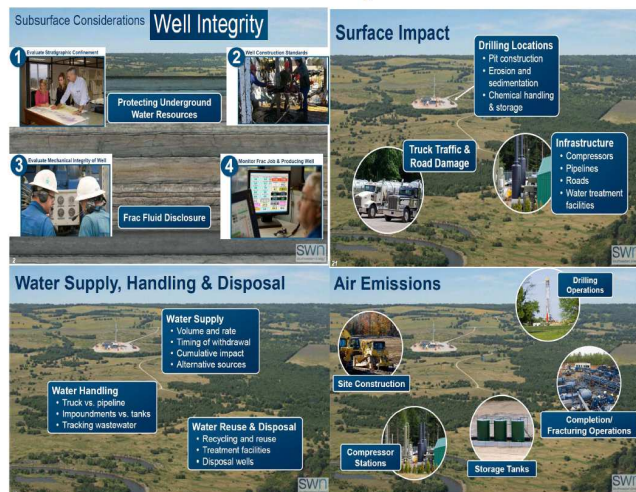
- SEC Guidelines
- IEA Forms

Breakdown of Cost Structure

- FDA, OPEX, CAPEX
- Price formula

Practical situations

- Development Plan
- Contingent resources



8. Risk Management & Environmental Footprint

Oil and gas operations often are located in fragile ecosystems and must act with responsible corporate governance. The petroleum professional can make or break the company. Company growth stagnates or becomes negative when engineering mistakes and concerns of environmental damage prevail in operations (BP, Cuadrilla). In contrast, competitive advantage develops when petroleum engineers are able to effectively raise the operational standards. US work methods developed for containing on-land oil and gas drilling operations provide guidelines for operational excellence.

Elephant in the Room

- Global Movements
- Stakeholder Options

Environmental Management Plan

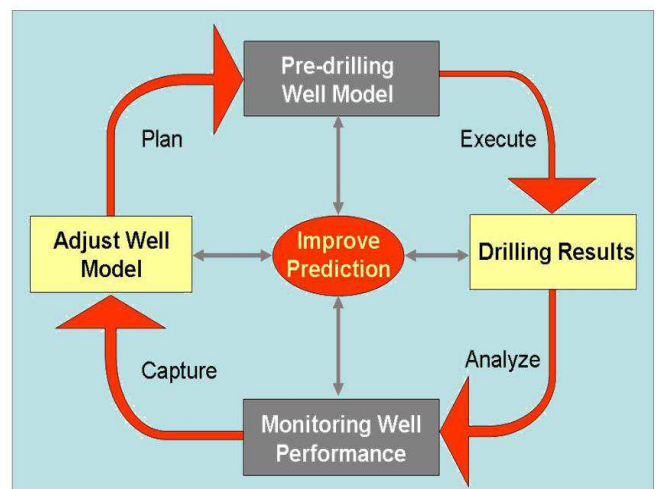
- Impact study
- Monitoring Approach

Operational Management

- Wastewater & Tremors
- Noise & Emissions

9. Selected Topics in Drilling Control & Wellbore Stability

Economic appraisal and safe exploitation of seismically defined drilling targets rest on lowering the risks inherent in costly drill holes. Deepwater drilling cost in the Gulf of Mexico has risen to about \$300 million per well (2013 industry quote), partly because of increased safety precautions in the aftermath of the 2010 Macondo well blowout. Drilling optimization by continuous feedback is essential. Present-day wellbore-stress monitoring-systems rely heavily on automated alarms for managing drilling pressure and maintaining wellbore stability. The implementation of real-time data-flow-monitoring in boreholes improves process safety and enables the identification of challenges before they become bigger problems.



We are delighted to provide additional information on our services.

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