

Upstream project values

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IPRES Norway AS is a software development company providing advanced tools to the upstream petroleum industry. We focus on integrated decision support with full stochastic uncertainty/risk handling for major asset investment projects and resource management which is important parts of Enterprise Risk and Enterprise Performance Management systems.

At the SPE finance seminar 4th June we presented some highlights from the use of IPRISK to show how a systematic stochastic approach to decision support secure optimised results compared to the more traditional deterministic methods. This means an integrated and consistent approach to asset valuation along the upstream value chain (Fig. 1) and represent a wide range of producing types and amount of data and the large uncertainties in the most important parameters. Fig. 2 illustrates some of the typical challenges in an offshore development project where only one discovery and a possible undrilled prospect are considered. In most cases it is even more complex with several discoveries, prospects and already producing fields evaluated in an area asset development and integrated simulation models, where all input is structured consistently with an overview of the main asset development options. This is also an excellent way to create the integrated teamwork necessary between all the key speciality disciplines involved. As part of the team work high level simulation models of some options can easily be built to investigate if they are



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jects and decision processes. The main challenge in the upstream oil industry is the complexity of the projects regarding ment model with multiple branches in a decision tree. To manage this complexity of possibilities IPRES is recommending interactive decision models of interest to carry forward towards the final decision. IPRES has structured the input



Fig. 1 Upstream value chain and Decision processes covered by IPRES tools

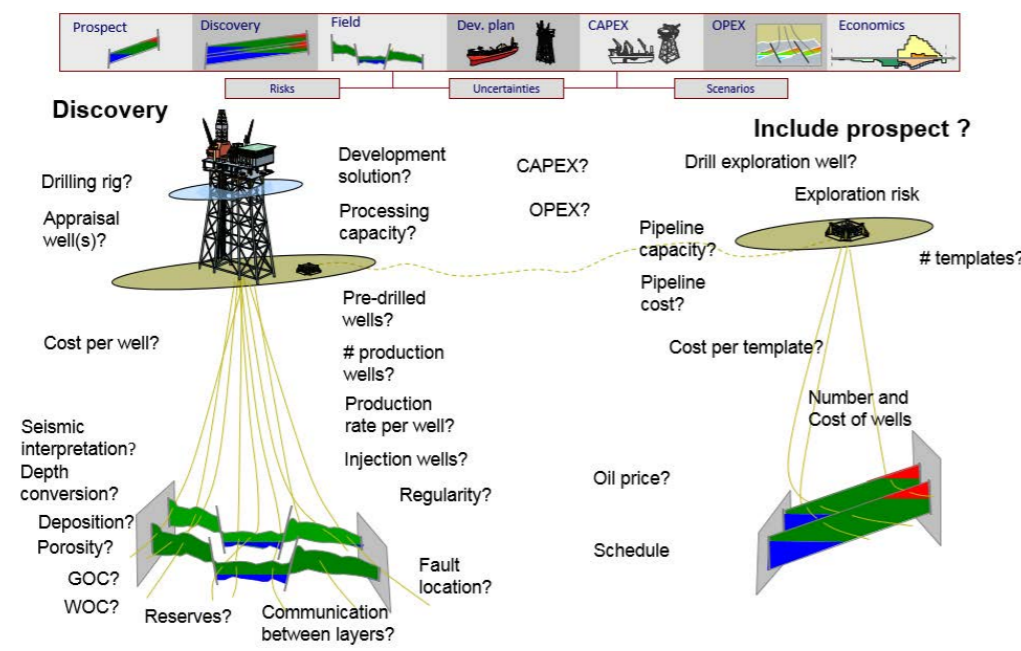


Fig. 2 IPRISK - Development Project Uncertainties (offshore example)

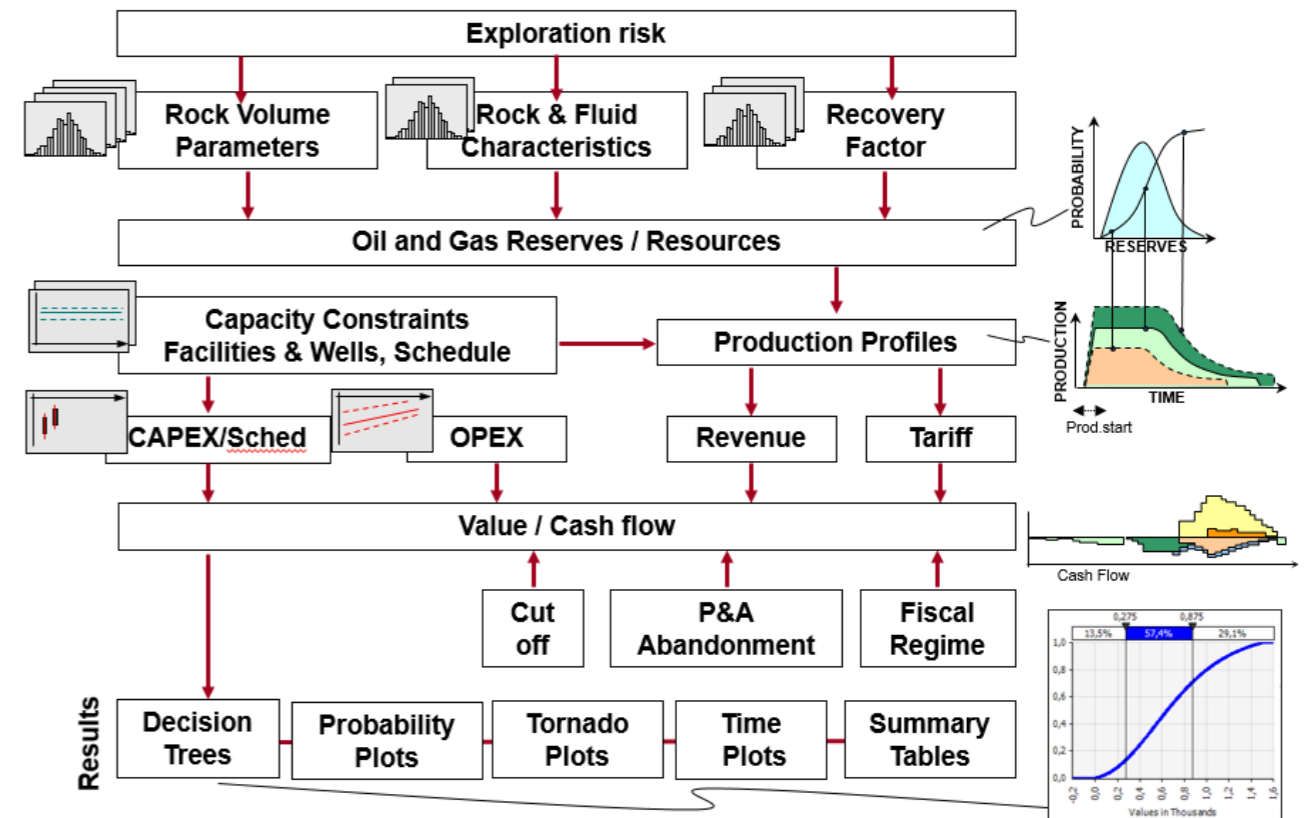


Fig. 3 Integrated Development Assessment

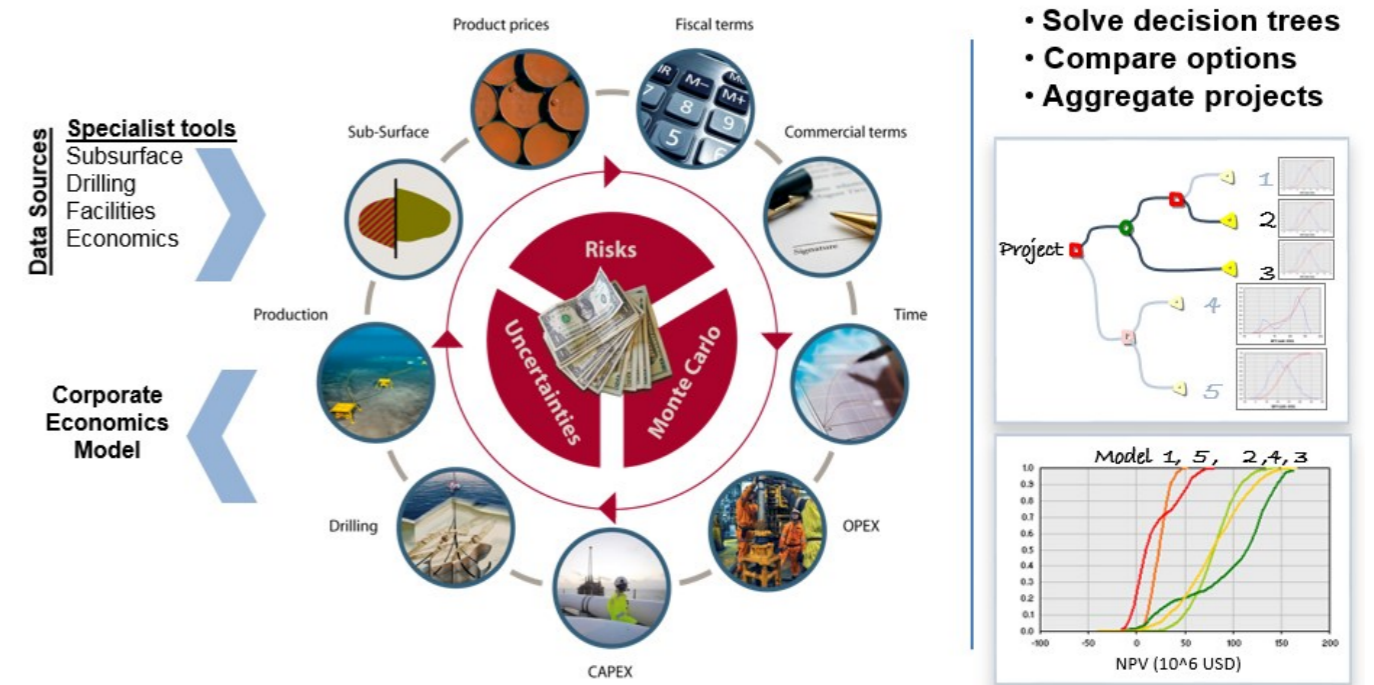


Fig. 4 IPRISK® Value Simulation Model - An Integration Platform The next generation solution

from all specialist disciplines necessary as shown in Fig. 3 including stochastic uncertainty on all parameters. The alternative development options are simulated with a Monte Carlo engine, Fig. 4, making it possible to evaluate the full range of

value both for each option and also screen and compare in detail all options. The integrated and consistent approach to asset valuation along the upstream value chain with full uncertainty handling

makes it also easy to compare the risks involved using Tornado diagrams, Fig. 5, to analyse the effect of all main parameters within the most important disciplines: subsurface (reserves, production), drilling (DRILLEX, time, events), fa-

cilities (CAPEX, capacities, time, events), economics product prices, inflation, discount rate, fiscal regimes, time). Scheduling/timing of all parts of the project is usually one of the biggest uncertainties and

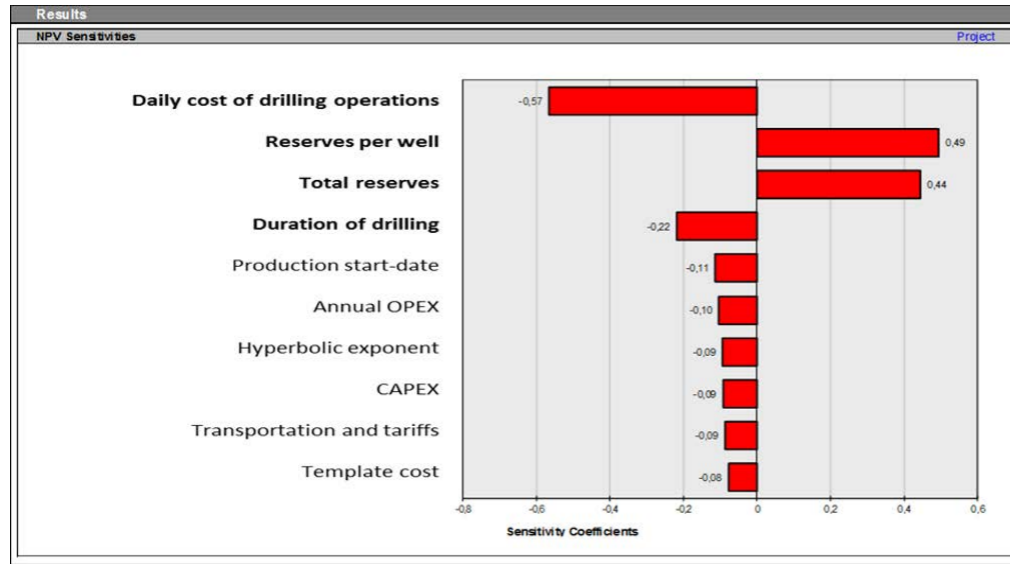


Fig. 5 Tornado diagram showing some key parameters effect on NPV

risks since so many parameters are time dependent and influencing on economic value. Controlling the timing of all parts of the project is much easier in such a consistent fully integrated simulation model compared to most other solutions available. This makes it easy to update all scheduling options in a project quickly saving time to analyse and improve results rather than spending time on input and calculations.

Through empirical studies it has been documented that Oil and Gas companies in general are risk averse in a non-systematic way. The industry in itself are subject to significant systematic (product prices,

market changes, etc.) and un-systematic risk (volumes, technical solutions, etc.). To maximise company and shareholder value it should be logical to accept and treat the risks of the industry consistently by using a combination of decision trees and stochastic modelling on single assets and portfolio's illustrated in Fig. 6.

The expected financial exposure of a company's oil and gas portfolio should of course be dependent on the size and financial strength of the company.

How will such a decision methodology affect company value over time?

To illustrate this we have made

the following simplified, schematic example:

- An E&P company has limited managerial and financial capacity.
- Develops one new asset per 5 year within a 20 year period
- Several assets available for development
- Example simplified to 2 asset types
- Discovery 1: Oil discovery, limited volumetric upside, subsea tie in to third party for processing
- Discovery 2: Oil discovery, high volumetric upside, higher CAPEX due to own

The difference in portfolio value in this example is 80 % higher (NPV after tax) if each decision is based on stochastic methods rather than a deterministic method.

The methodology with full stochastic uncertainty handling has proved that decisions are optimised, often as much as 30-40%, compared to the traditional deterministic way both on single projects and even more on a portfolio or group of portfolios of asset development projects as shown here with an example of 80% added value.

It is documented that the financial benefits is increased shareholder value by this consistent approach to uncertainty and risk evaluation of each asset and portfolios by

- Reduction in suboptimal asset/field development decisions
- Reduction in suboptimal well prioritisations
- Efficient integration of the entire, integrated value chain with uncertainty
- Time saved when performing analysis iterations and updates
- Time and costs saved by standardisation
- Reduced probability of errors

And now with the increased focus on better revenue on each project and at corporate level, it is expected that more effective integrated work

processing (FPSO)

- Decision methodology: Stochastic or Deterministic

In the plot, Fig. 7 below we have compared NPV for the 2 asset types, shown both with stochastic and deterministic evaluation.

A company which only uses a pure deterministic approach will choose Discovery 1, due to highest "Base case" value.

A company which uses a stochastic approach will choose Discovery 2, due to the highest Expected (Mean) value.

The cumulative value of a company portfolio represented by repeated investments in one new asset every five years, a total of four times, is illustrated in Fig. 8.

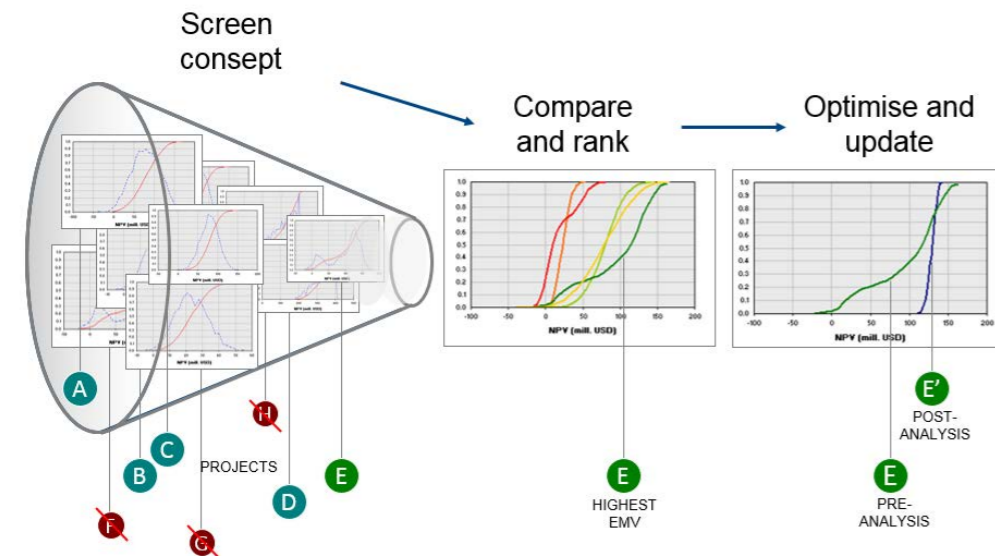


Fig. 6 IPRISK Field Workflow

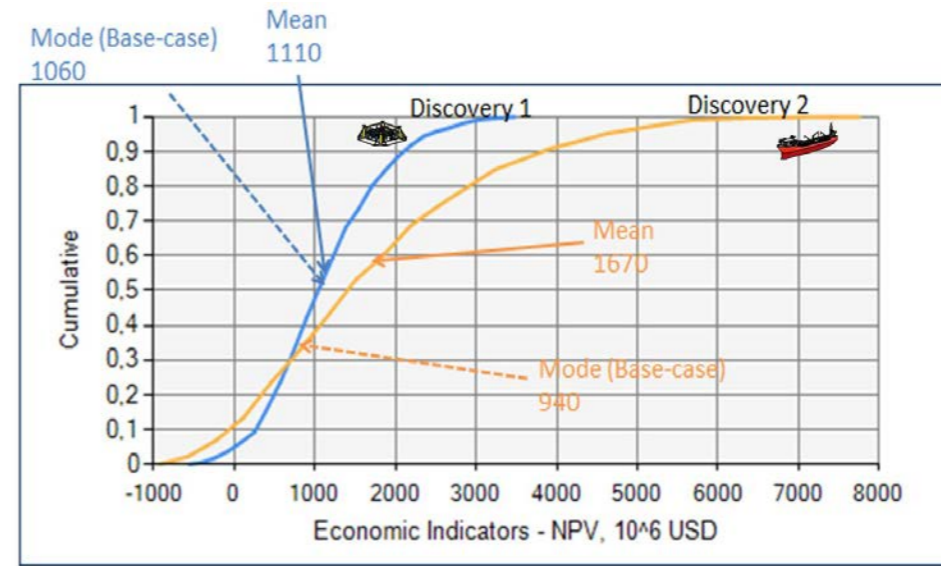


Fig. 7 Investment example: Comparison of Deterministic and Stochastic approach

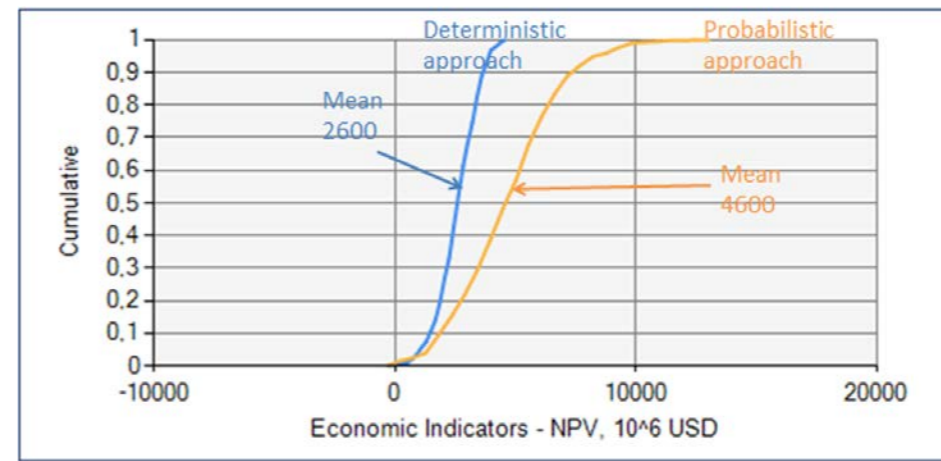


Fig. 8 Value of portfolio. Stochastic vs. Deterministic decision making

processes will get a lot of attention in all companies globally, Fig. 9. The increasingly technically and commercially complex projects with challenging margins will lead to more focus to develop integrated teams for decision support using advanced methodology and tools for effective and more optimal decisions on all asset development projects.

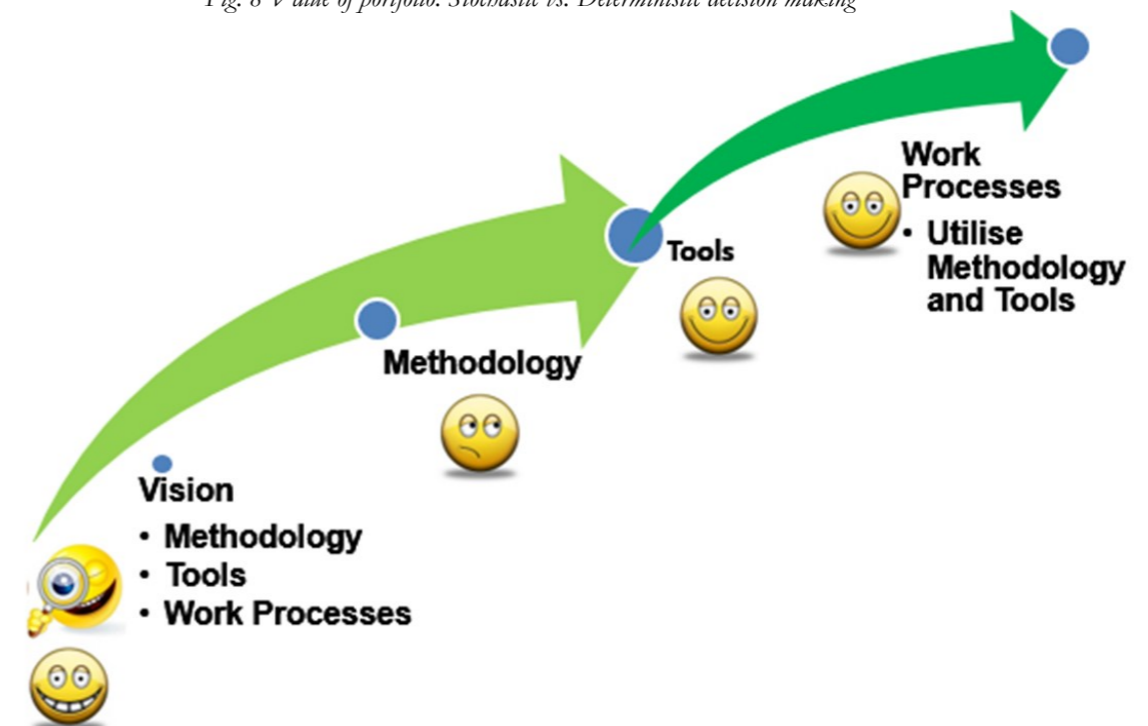


Fig. 9 Stochastic Approach the New level of Decision Analysis