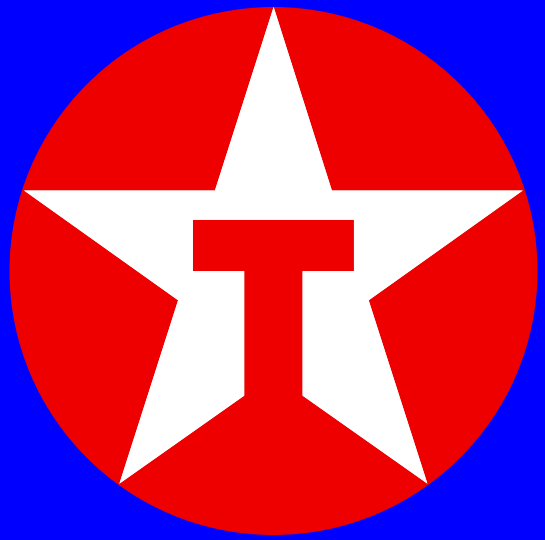
Real Options in Practice: Two Examples from the Energy Sector



Sue Lisowski - Texaco Inc.

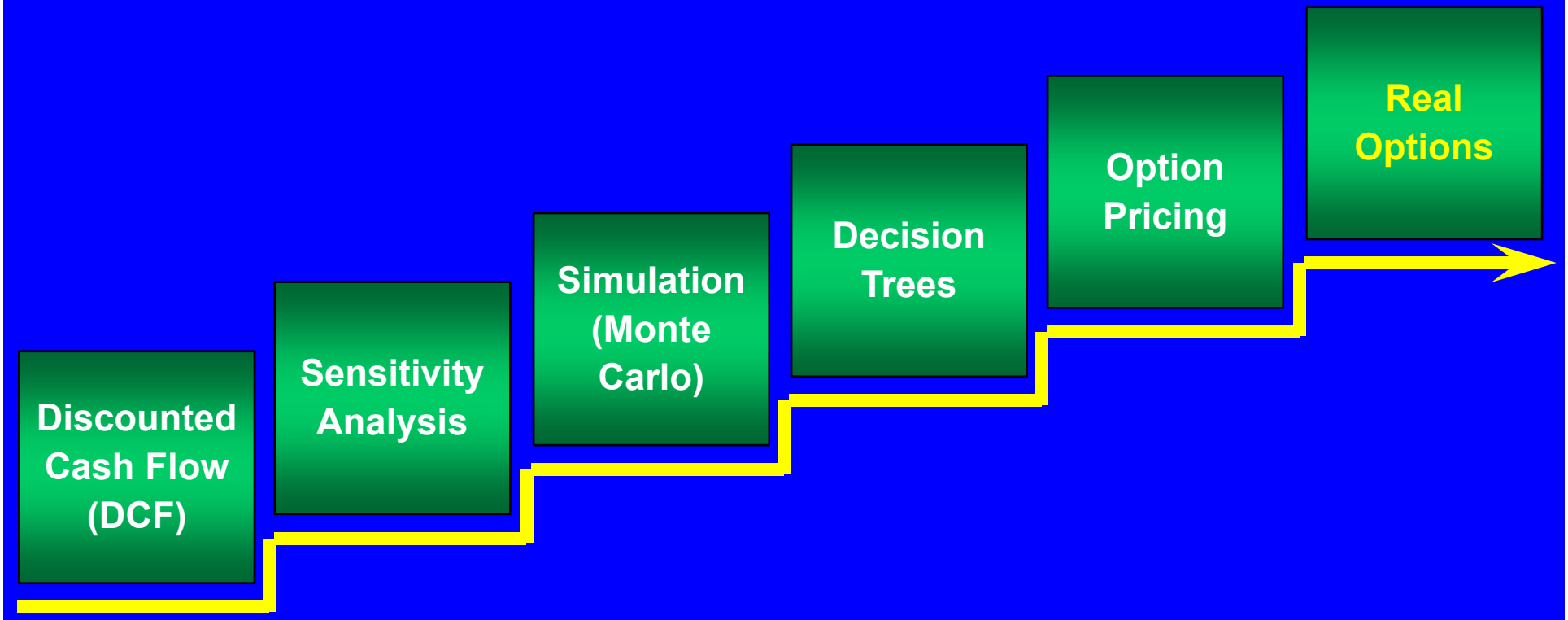
DAAG (Decision Analysis Affinity Group) 2000

Calgary, Canada - May 17-19, 2000

Outline

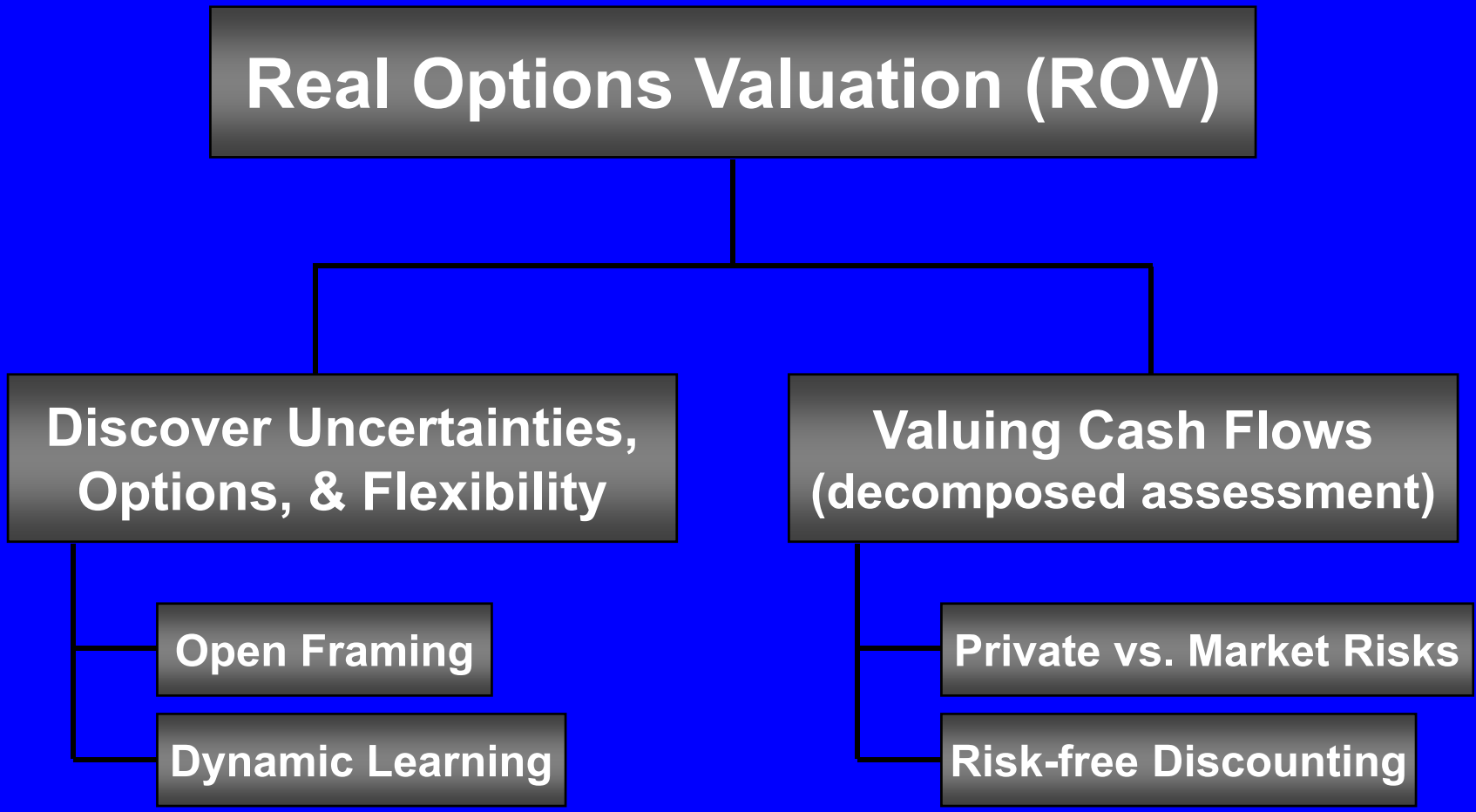
- What is different about Real Options?
  - Modeling options and managerial flexibility
  - Valuing cash flows
- Example 1: New Technology
- Example 2: Offshore Opportunity
- Conclusion

Why Real Options Valuation (ROV) ?

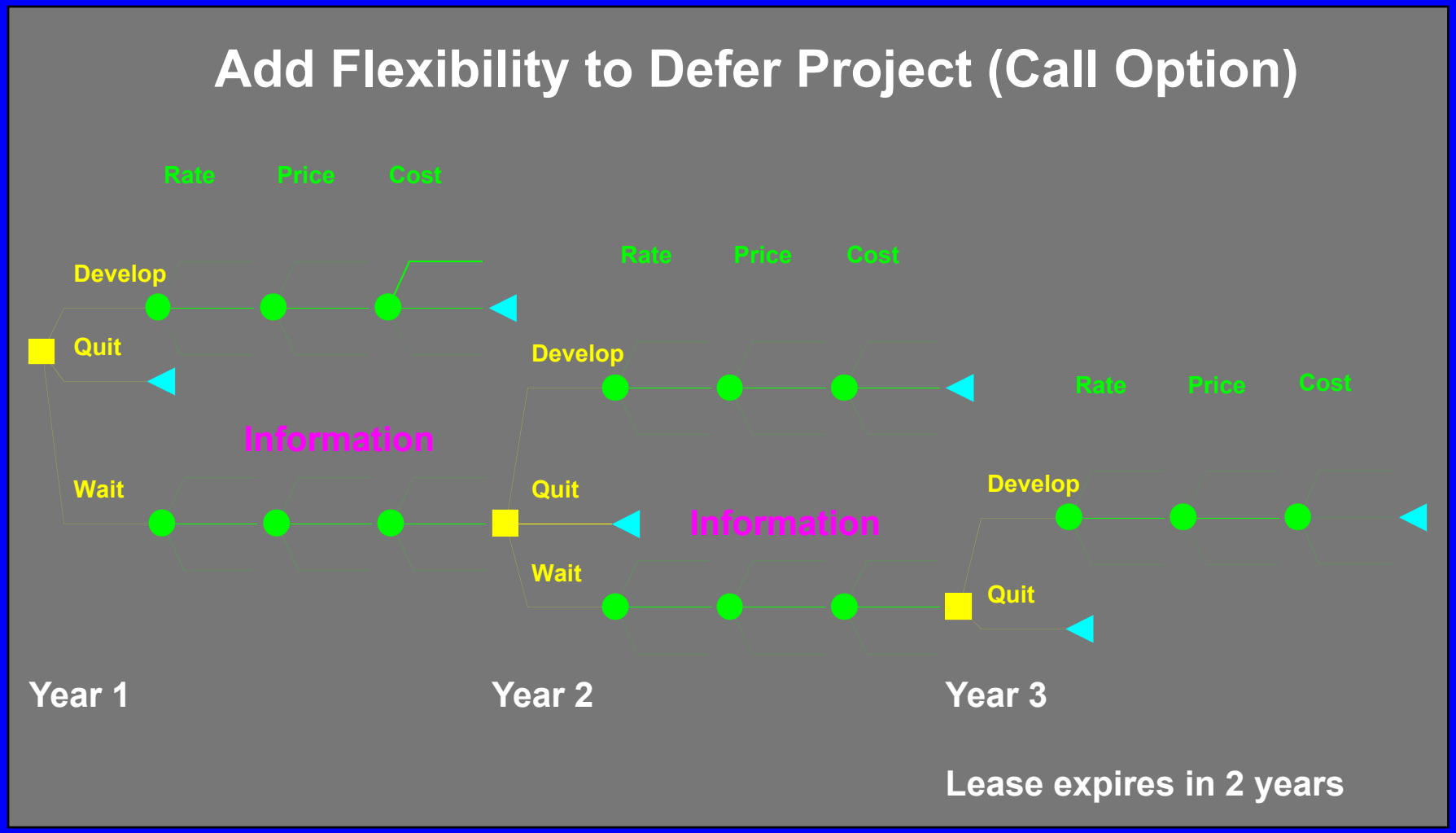


Real Options Valuation (ROV) combines and extends DCF, Option Pricing, and Decision Analysis

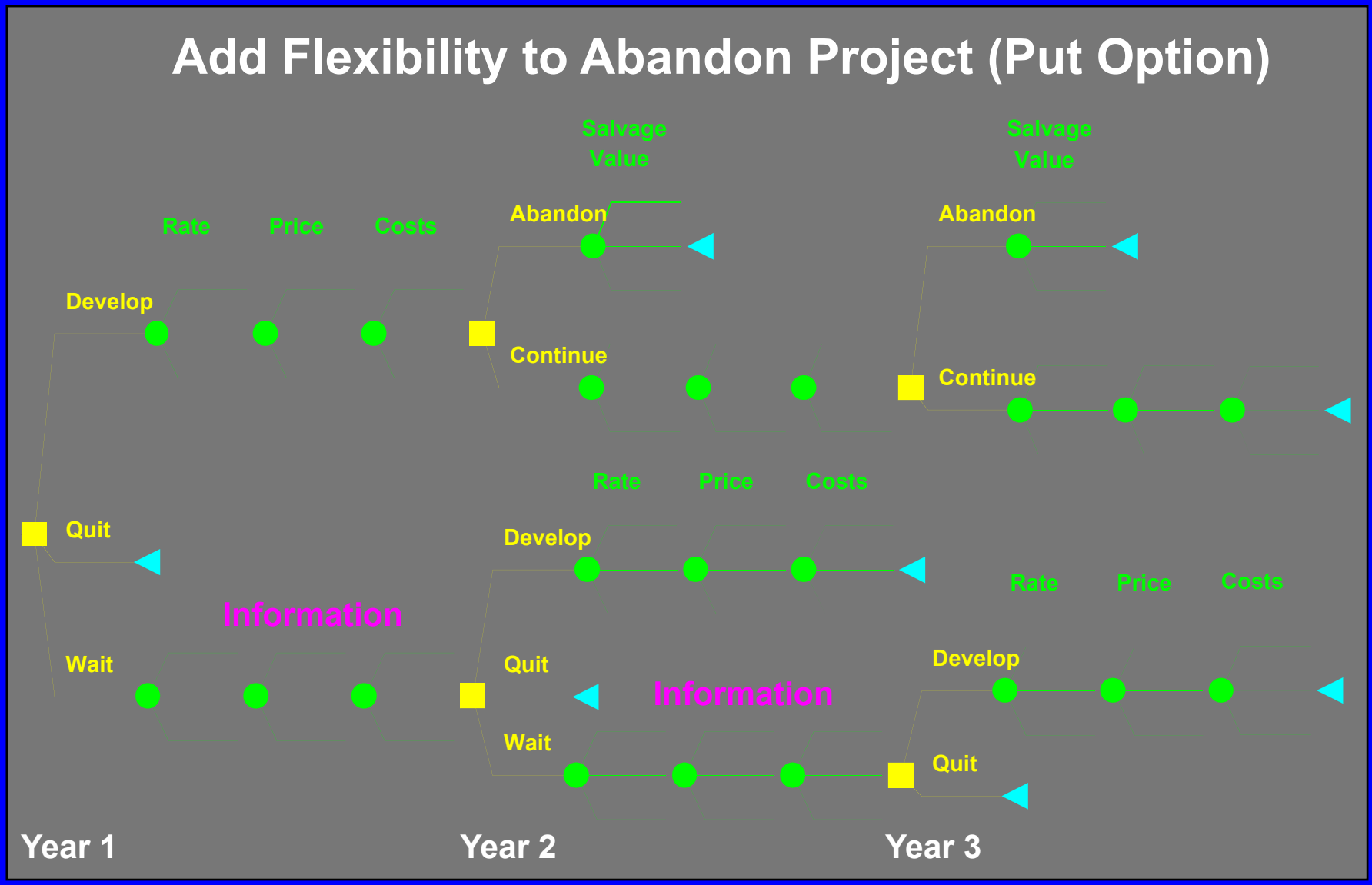
The two dimensions of Real Options Valuation



What are real options?



What are real options?

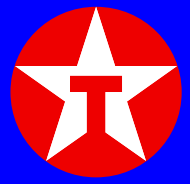


Value cash flows with appropriate risking

- Use option pricing to model "market" (e.g., price) risk:
  - Apply risk-adjusted probabilities to capture risk premium (can determine from futures and options markets)
- Use decision analysis to model "private" (e.g., volume) risk:
  - Apply subjective probabilities to risk "non-tradable" assumptions (can determine from historical databases and expert assessments)
- Discount the resulting risk-adjusted cash flows at risk-free discount rate

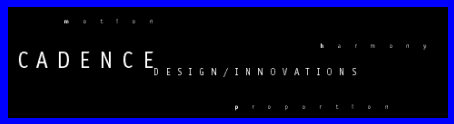
Who uses ROV?*

Energy

Investment Banks /Consultants

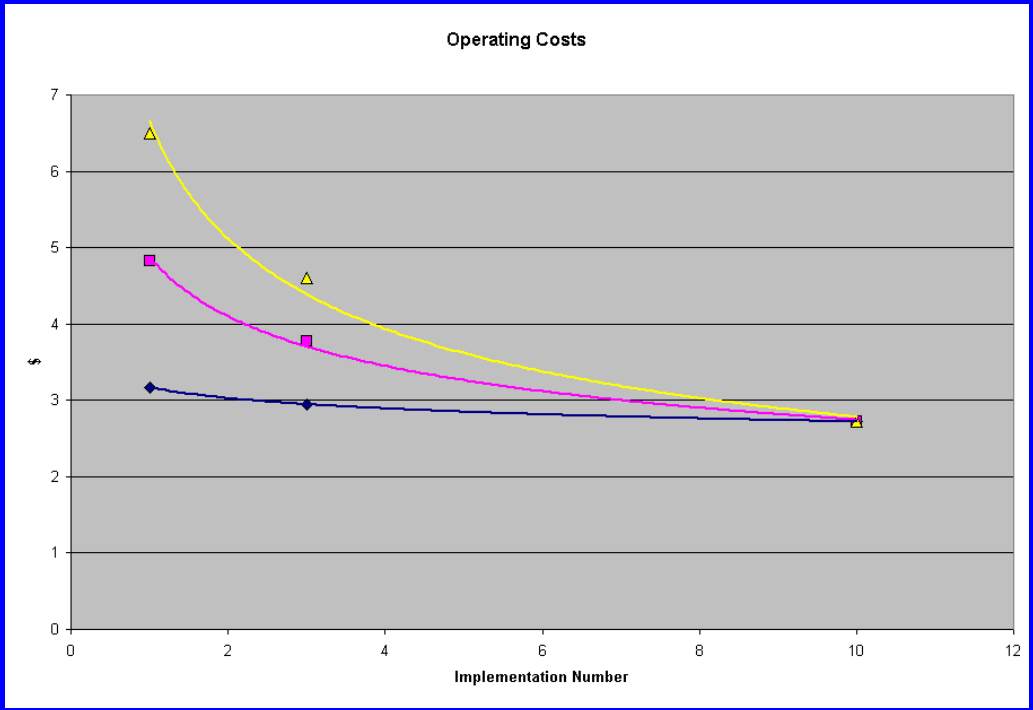
Computer/Internet Telecommunication



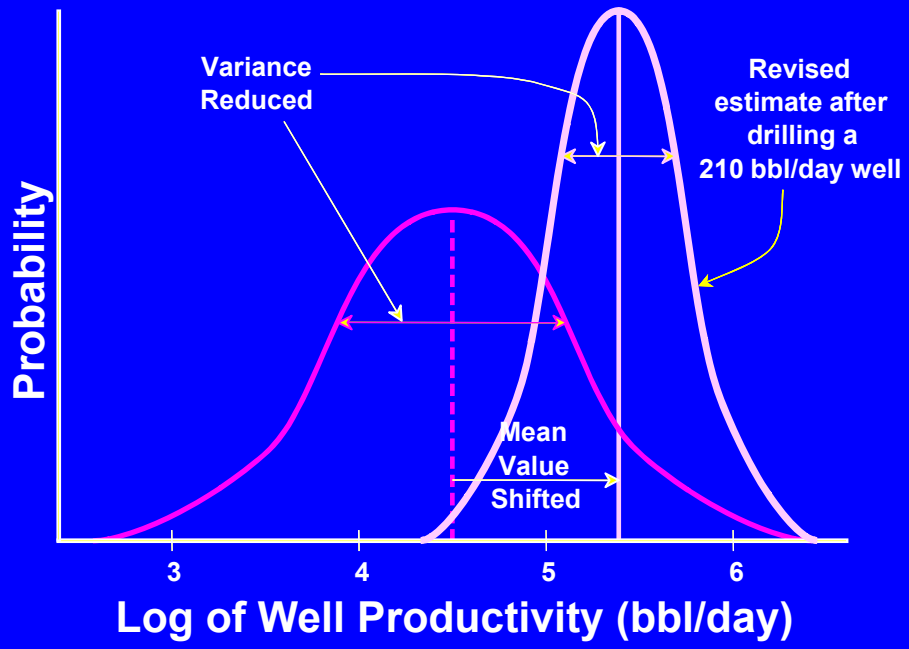
* partial list

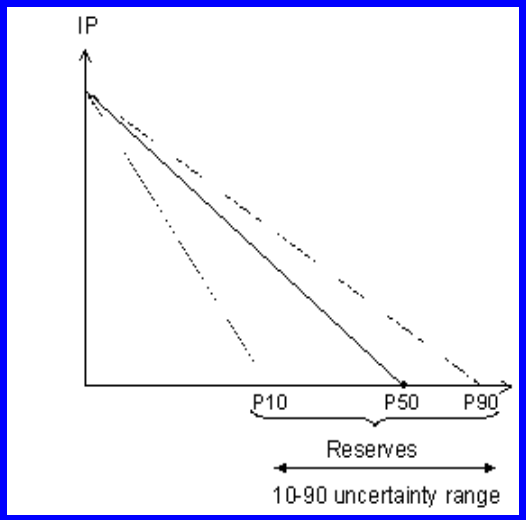
Learning

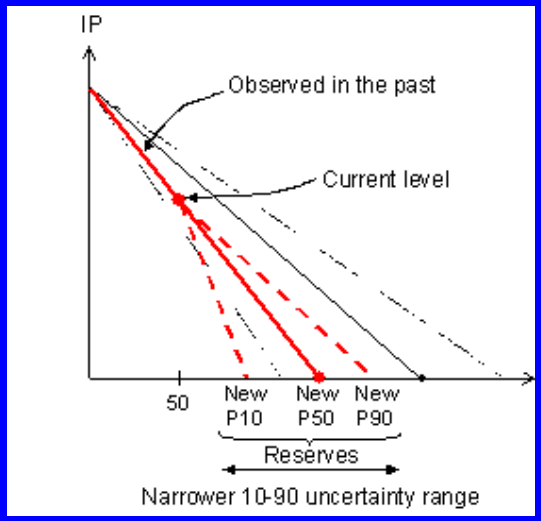
- Enhance subsequent decisions (option value) by incorporating learning on new information
- Learning occurs at differing speeds and in a variety of ways



Learning



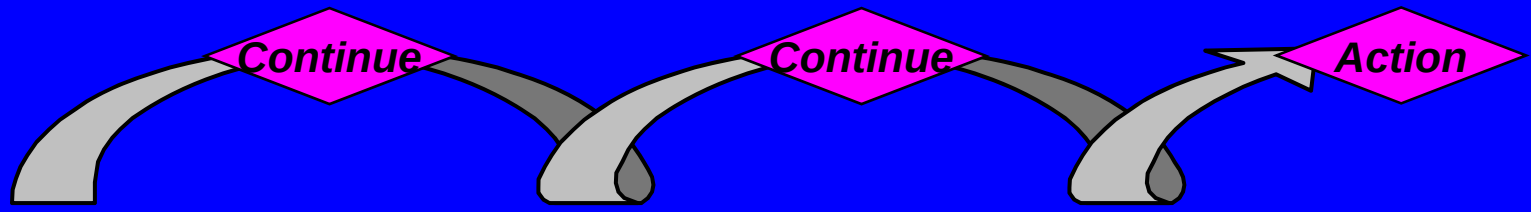




Graphs courtesy of ADA(PwC)

ROV is not simply a better tool.
It is an objective, all-embracing process.

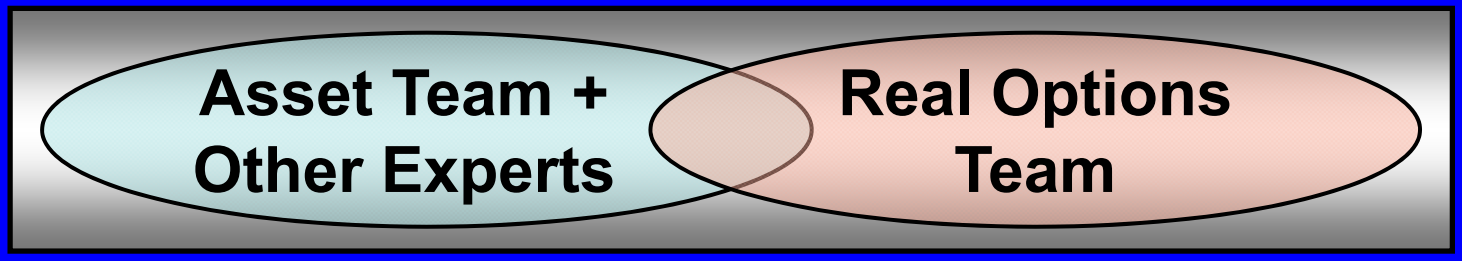
Decision Makers



Open Framing
- Strategic Environment
- Uncertainties
- Options, Flexibilities

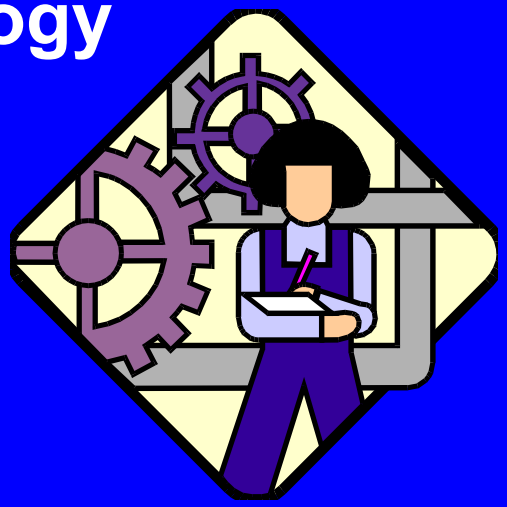
Analysis
- "Smart" Modeling
- Uncertainty Assessment
- Market Pricing

Interpretation
- "No regrets" Strategy
- Dynamic Road-map
- Leveraging Uncertainties



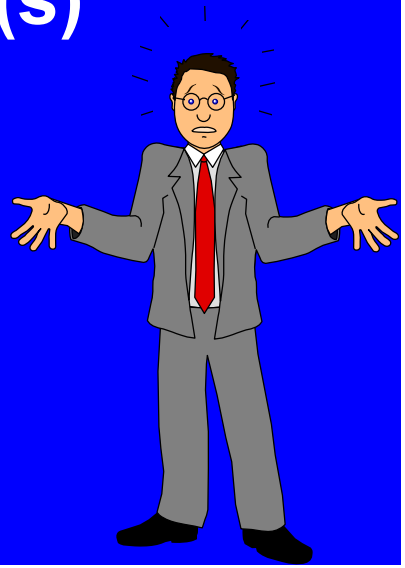
Example 1: New Technology

- From commercial standpoint, relatively unproven technology
- More than one source of technology, with providers at differing points in development and experience
- Anticipate variations in technology performance and costs, depending on provider



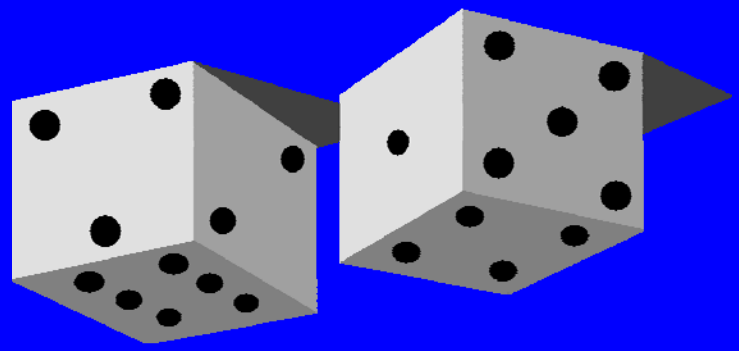
Questions

- Should we make a major commitment to this technology?
- What commercial opportunities exist for application of this technology in the long-term?
- In the short-term, on which commercial opportunities and technology provider(s) should we focus?
- How does commercial application of this technology look from a portfolio perspective?



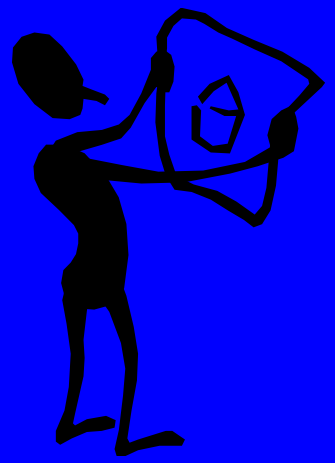
Areas of major uncertainty

- For each provider, technology effectiveness and cost
- For each provider and location, installation and operational costs
- Prices of inputs and end-products
- Potential for non-technical delays
- Contractual terms and taxes in various locations



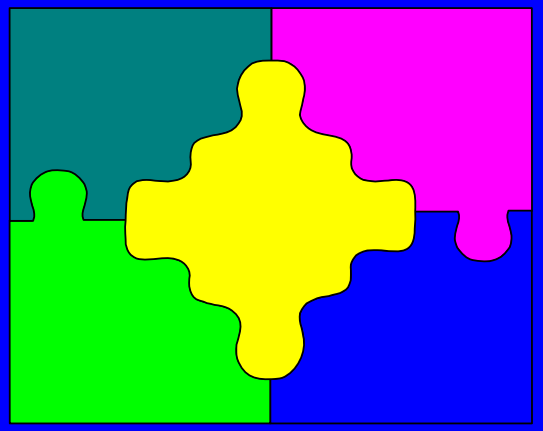
Decisions to be evaluated

- Which technology provider(s) should we use?
- Should we do more testing before committing to the technology?
- What implementation size is best?
- What implementation schedule is best?
- When should we take advantage of potential synergies?

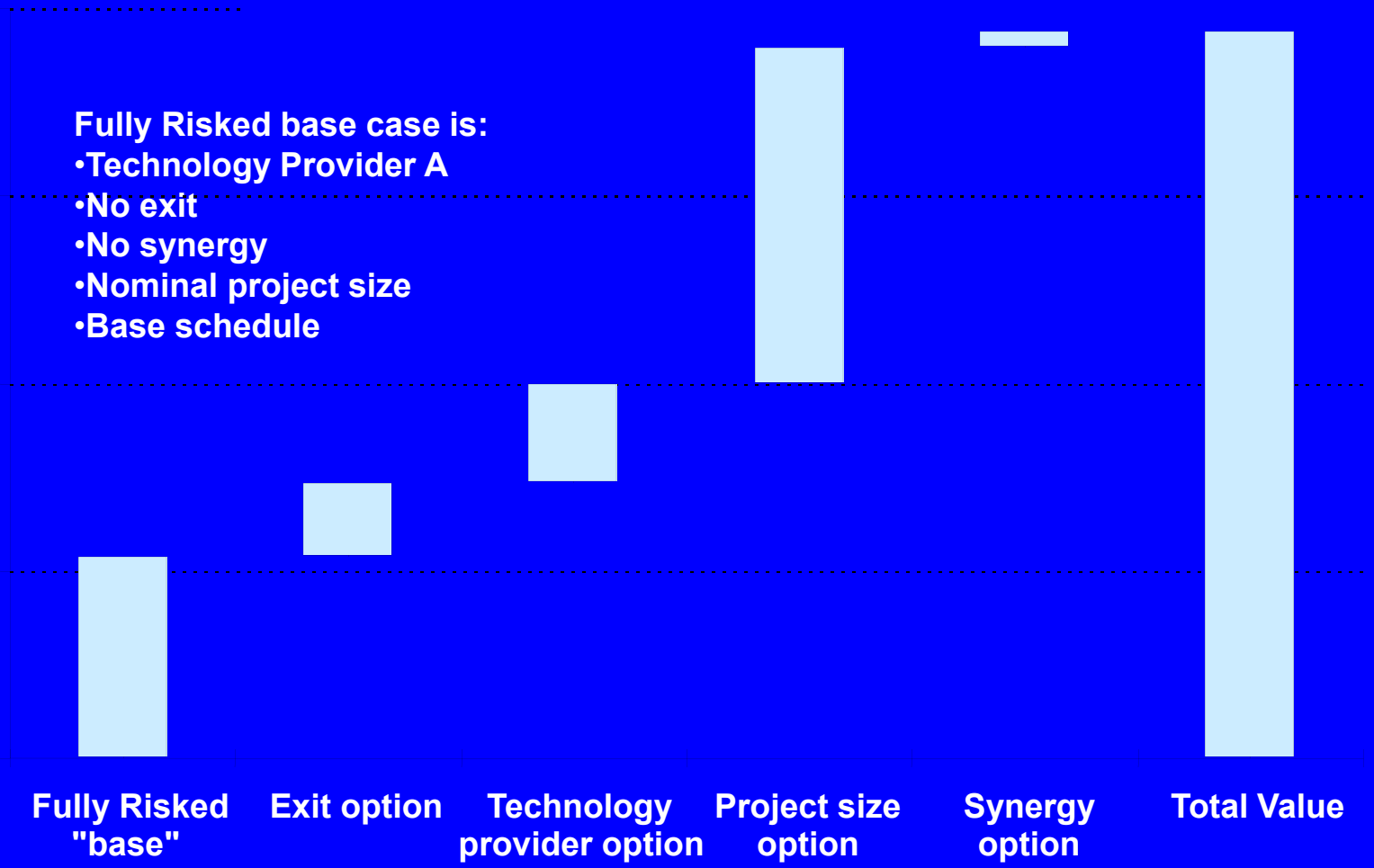


Approach taken

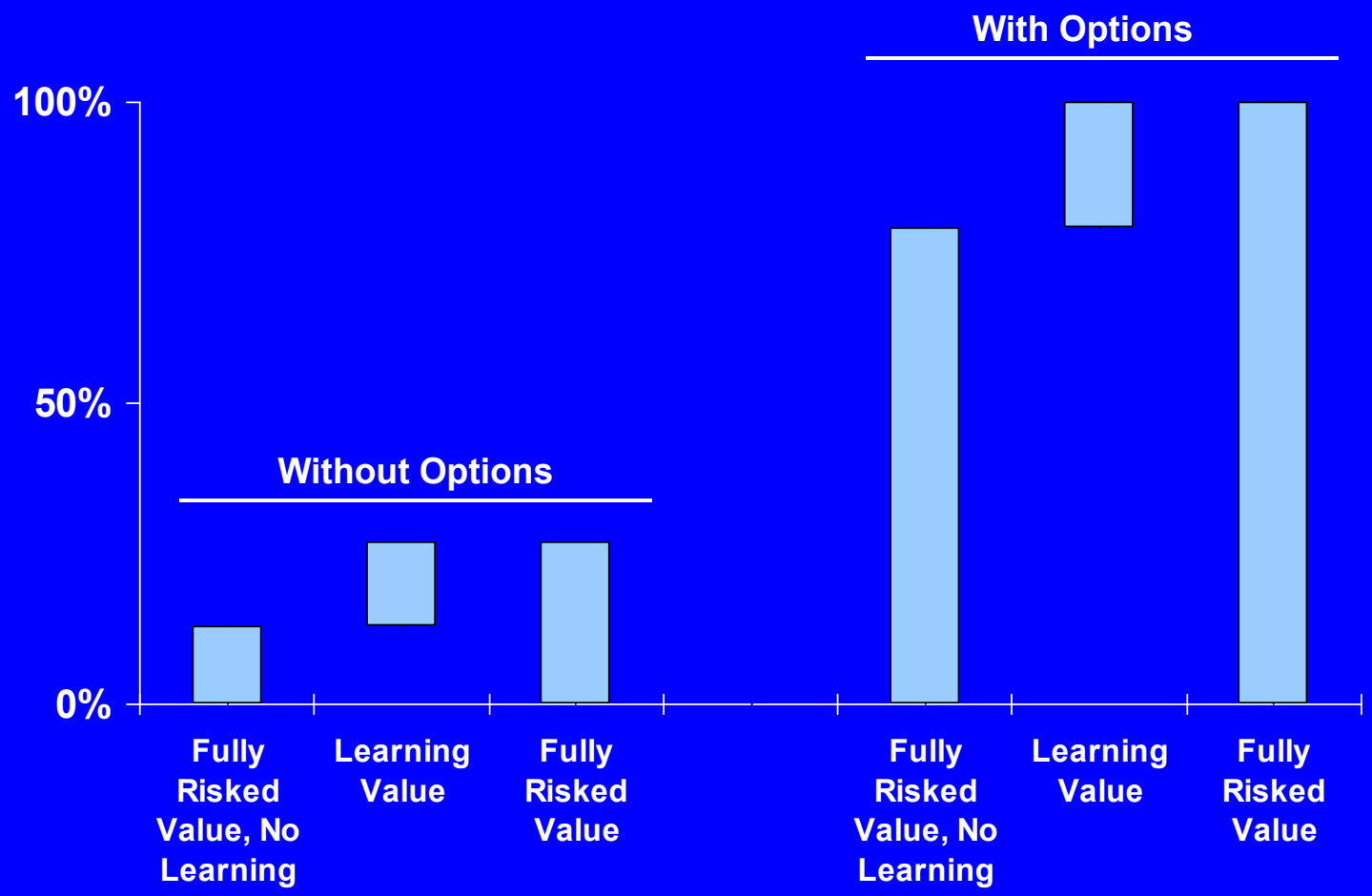
- Modeled approximately 10 separate opportunities
- Evaluated 3 separate schedules
- Treated as a “portfolio” of opportunities
- Placed significant emphasis on learning from project to project within each schedule



Sources of option value

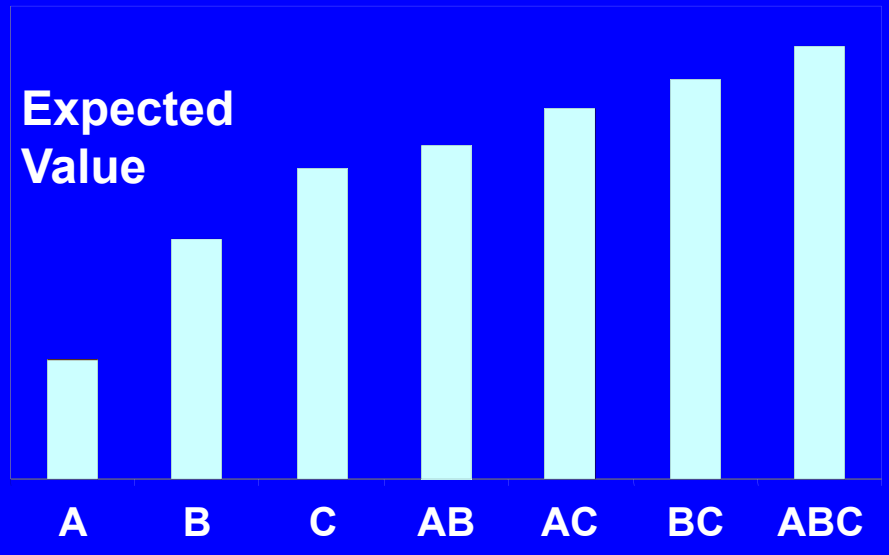


Relative value of learning*



* learning about technology, operating efficiency, operating costs, and capital costs

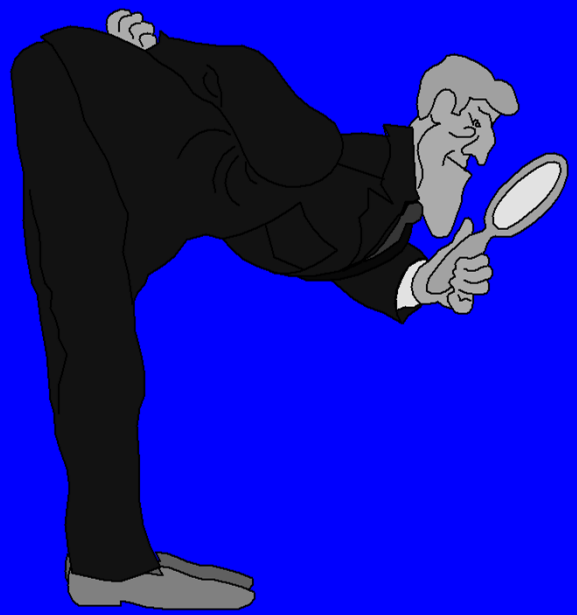
Keeping all technology providers available is the best choice



- No single provider is always the best choice
- For most opportunities, having a choice of technology providers is best

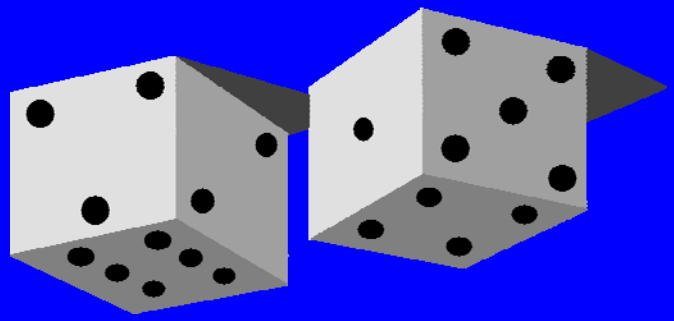
Example 2: Offshore Opportunity

- Harsh or unique conditions
- May be little or no infrastructure in place
- Costs are higher
- Operations more difficult
- Large reserves



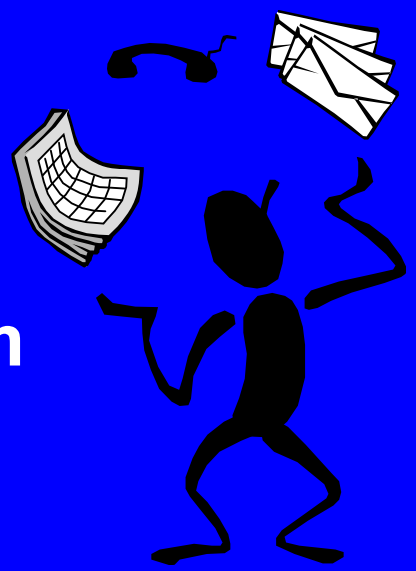
Areas of major uncertainty

- Amount of oil and gas
- Recoverable oil and gas
- Drilling and platform costs
- Value of oil and gas
- Impact of delays
- Contractual terms, regulations, political issues, special environmental issues

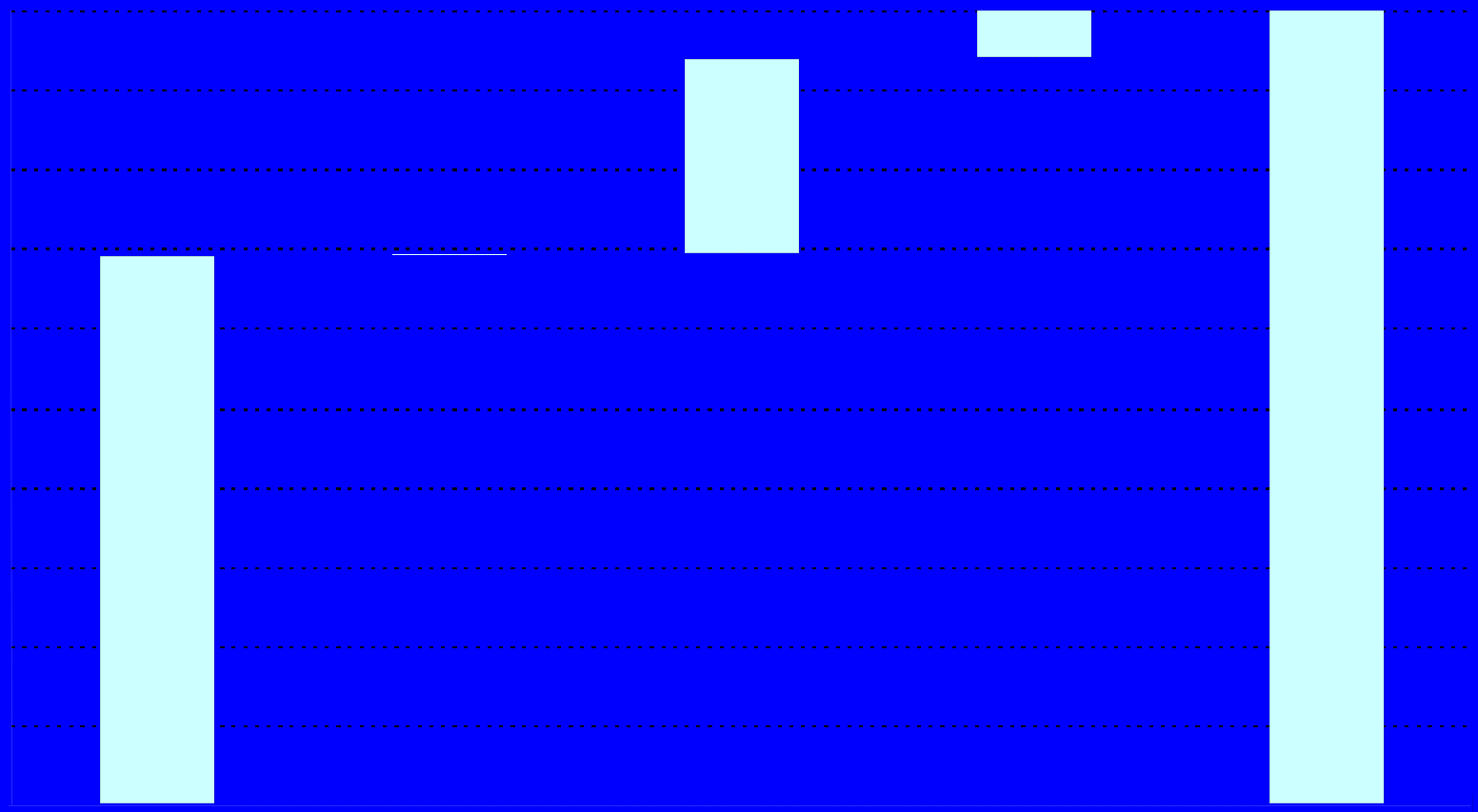


Decisions to be evaluated

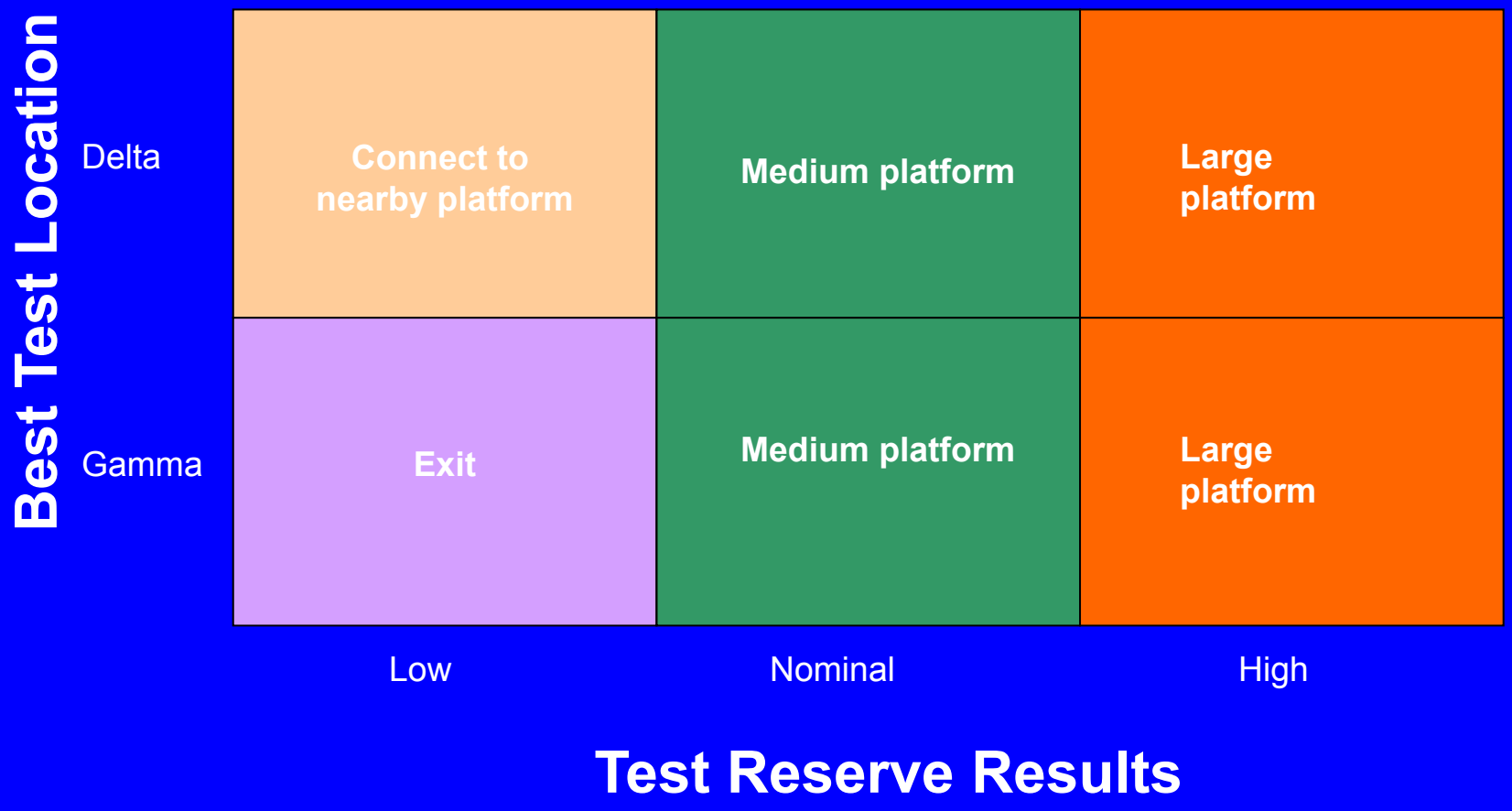
- What size should the platform be initially?
- Should the platform be expandable?
- When should we expand the platform? How much?
- Should the development plan be rapid or staged?
- Should we handle production from other opportunities?



Sources of option value

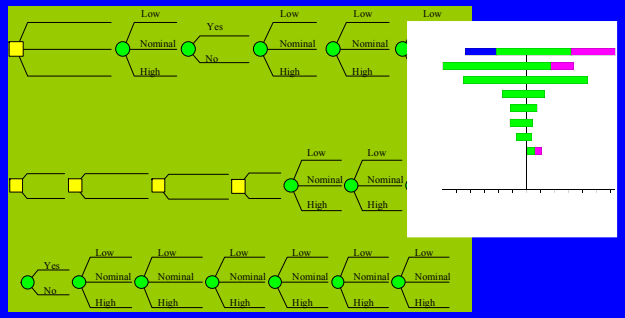


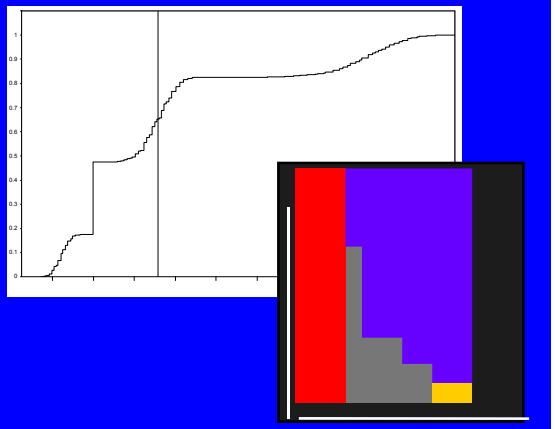
Optimal strategy map



Results

Calculations and Analysis





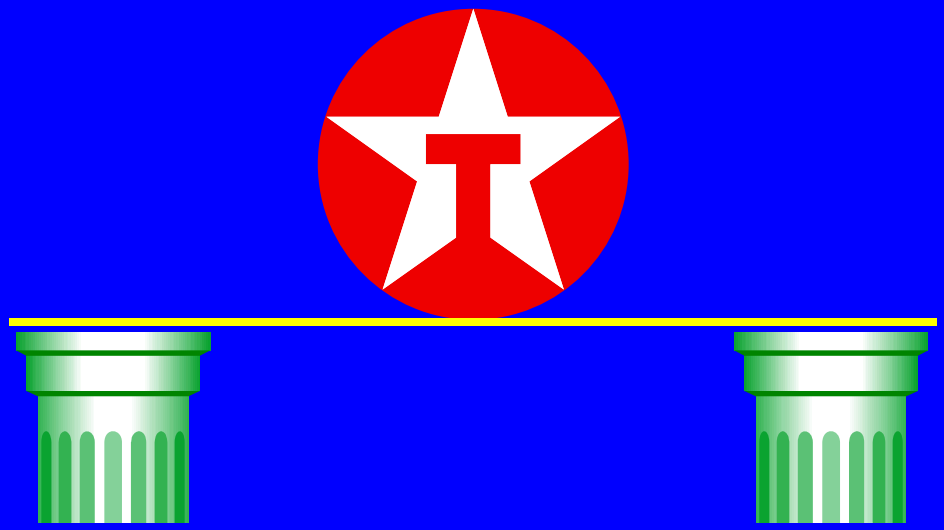
Opportunity workbook

Model Building

Expert Assessments

Open Framing Session

The long-term challenge is a cohesive, enterprise solution



Strategy ⟷ **Execution**

Real Options Valuation

Portfolio Optimization

Enterprise Risk Management

Value-Based Accountability