



# **The Role of Uncertainty Assessment in Appraisal and Field Development Strategy**

**Mihály Gajda**

**Szolnok, 17 November 2016**

**Society of Petroleum Engineers**

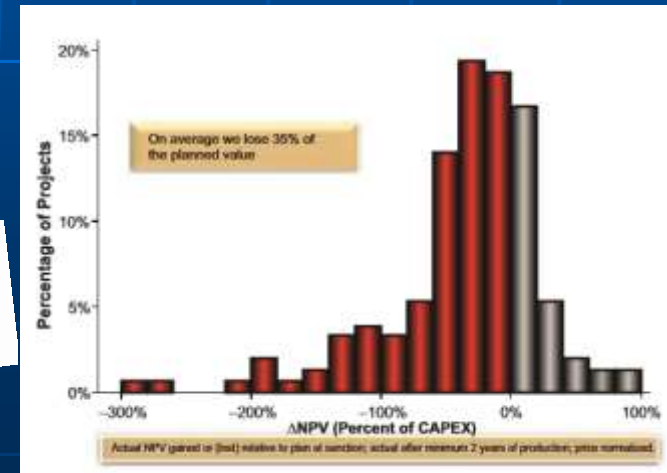
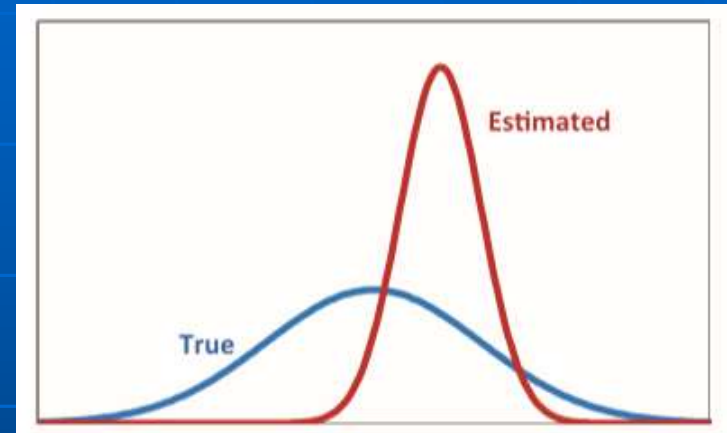
# Uncertainty All Around US

**Industry Needs Re-Education  
in Uncertainty Assessment**

**Understanding Uncertainty  
and Risk in Capital Projects**

**Beyond forecasting: Energy markets in a time of  
unprecedented uncertainty**

**Wanted: A New Type of Business Leader  
to Fix E&P Asset Developments**



# Misuse

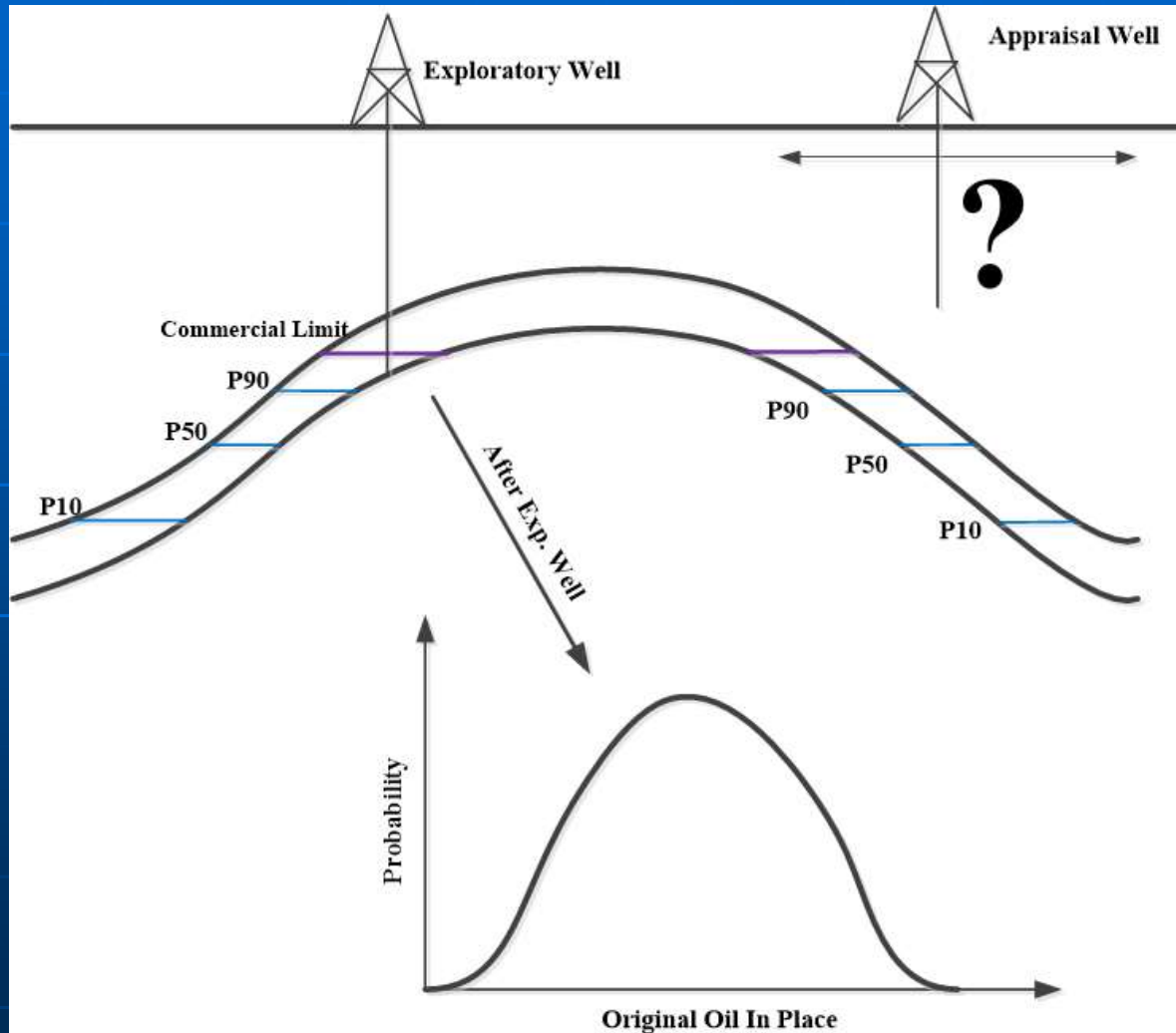


- Every study that we make must support decision making
- Usual output is  $\sim 100$  realization and no care what it is used for!
- As a consequence the results are often confusing rather than supporting decision making

# Major Areas of Application

- Potential of an Exploration Prospect
- Appraisal Strategy
- Value of information (justification of measurements)
- Field Development Strategy
- Individual Project Approval
- Budgeting/Project Ranking
- Portfolio Management

# Objective of Appraisal



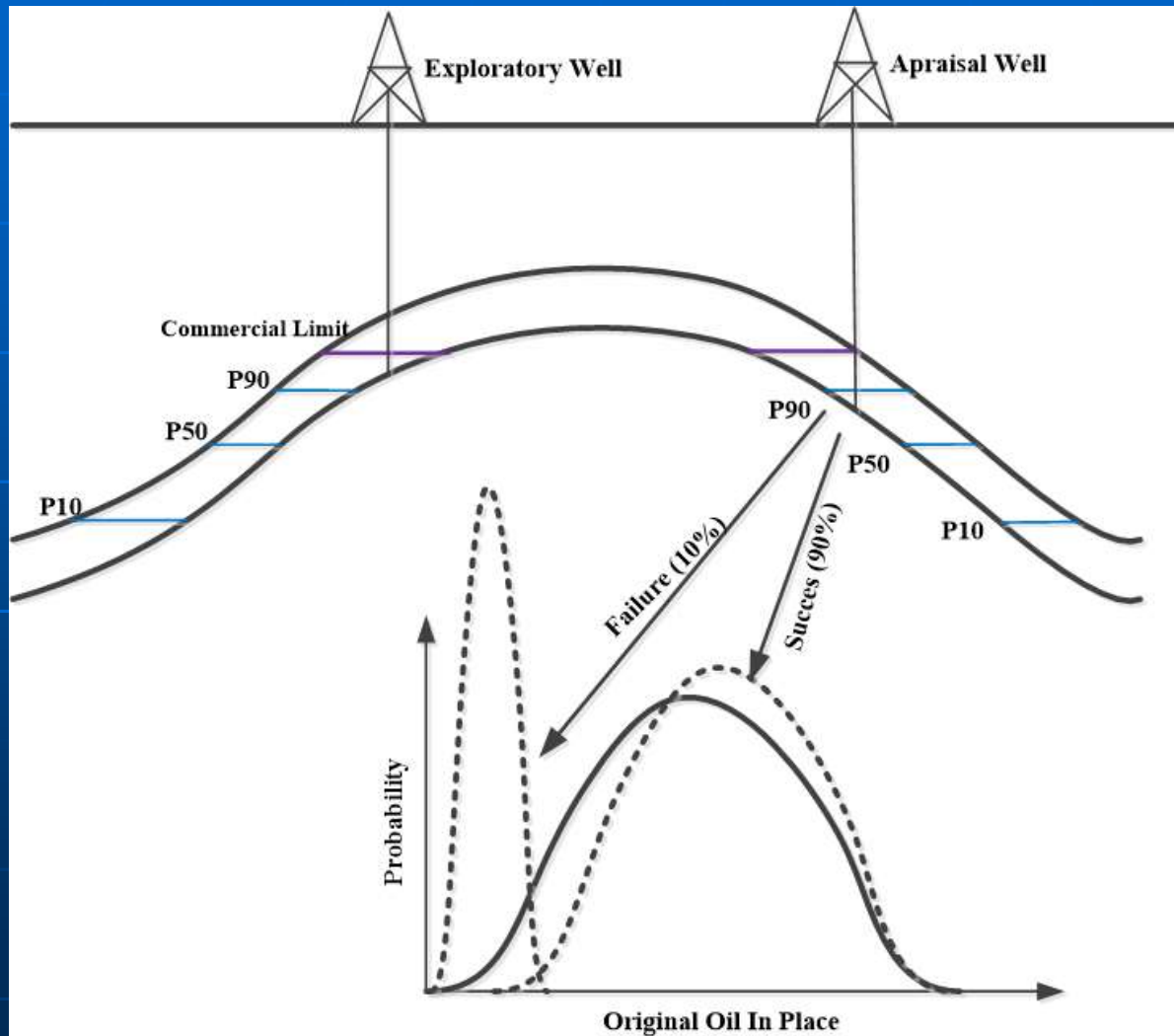
Appraisal is an information gathering activity

Main uncertainties:

- Volume related
- Productivity related
- HC-Quality related

Appraisal well is a discrete learning event

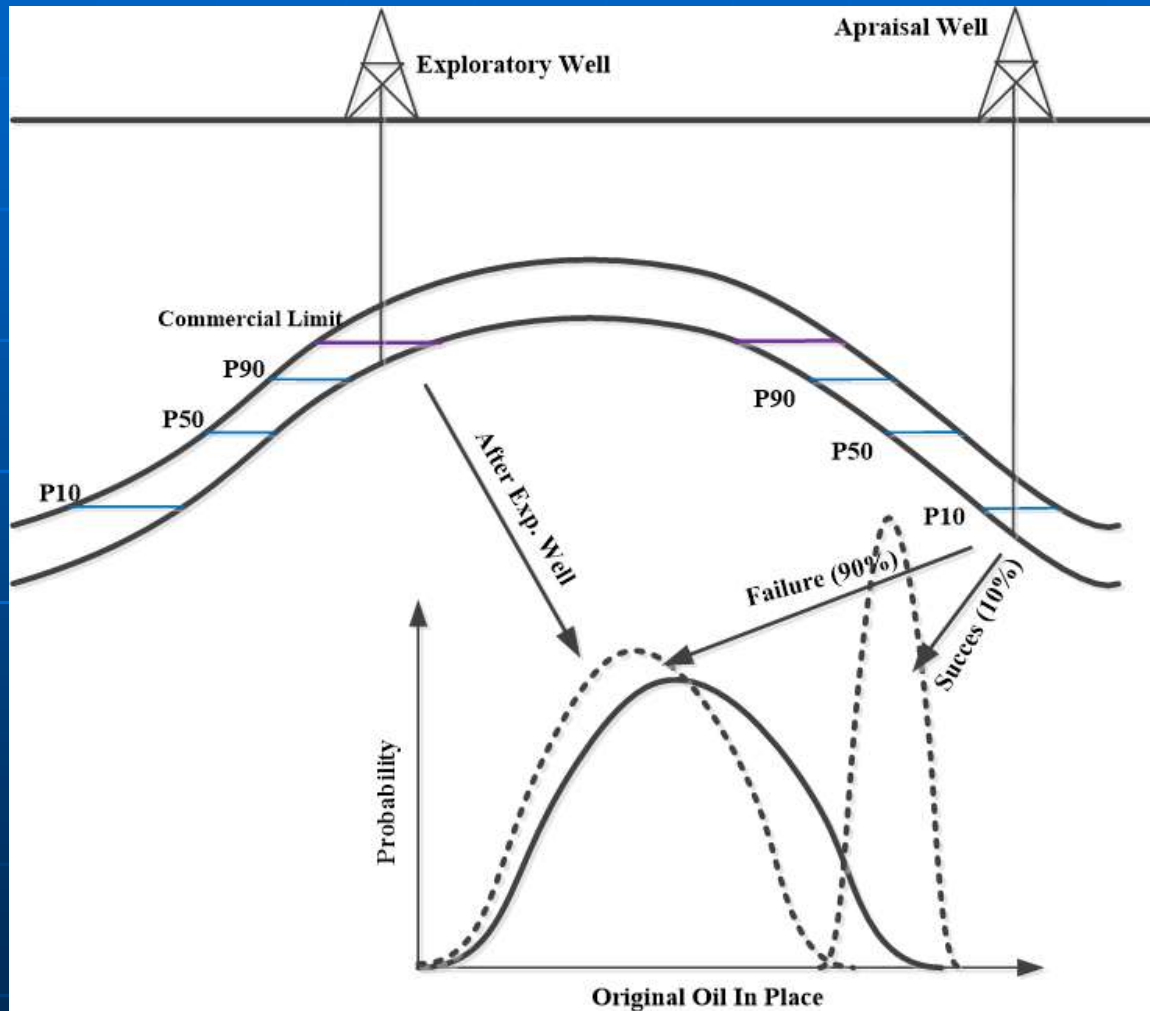
# Appraisal Well Location



- Drill near to P90 WOC
- In 90% of the cases the uncertainty reduction is negligible

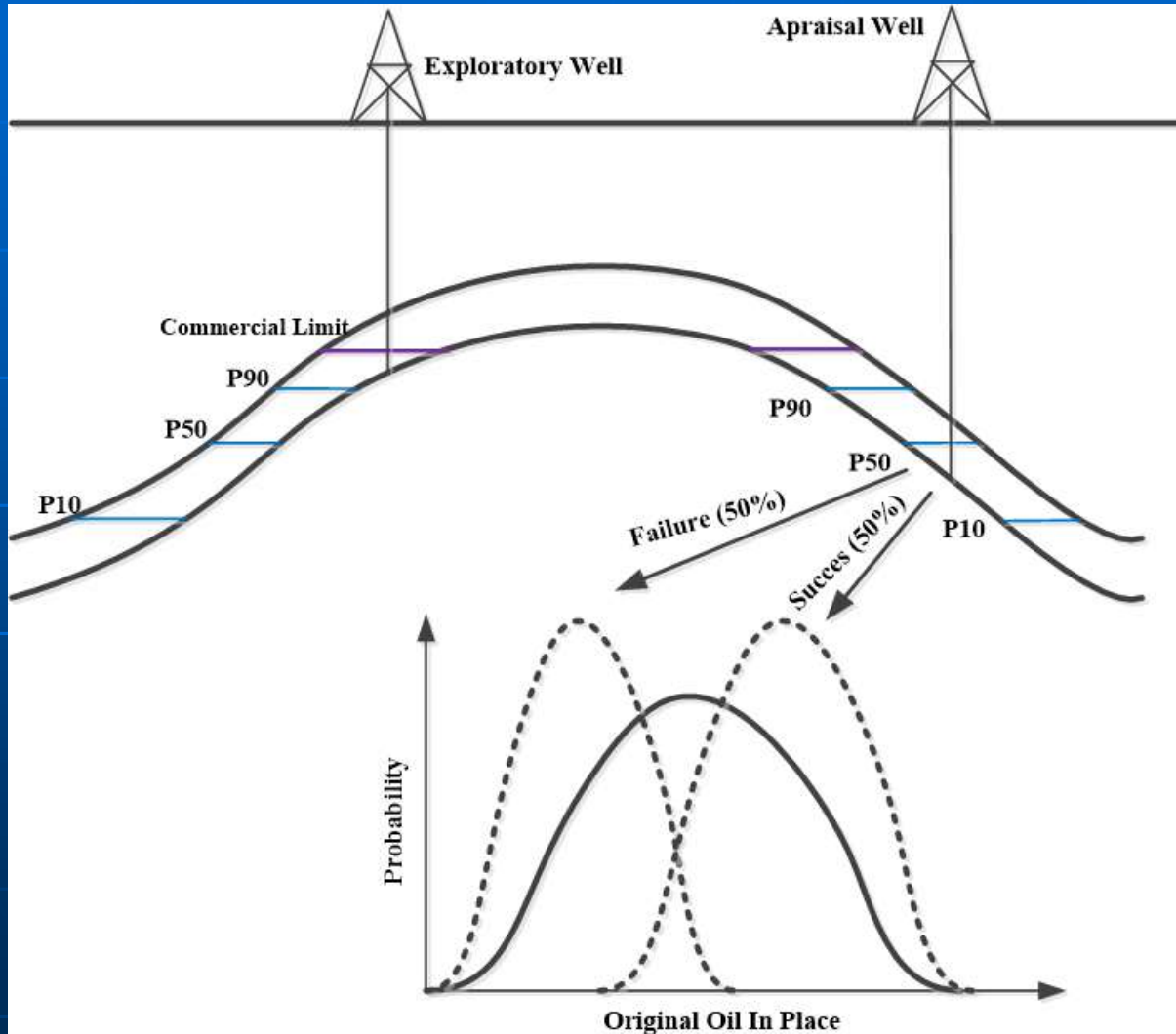


# Appraisal Well Location



- Drill near to P10 WOC
- In 90% of the cases the uncertainty reduction is negligible

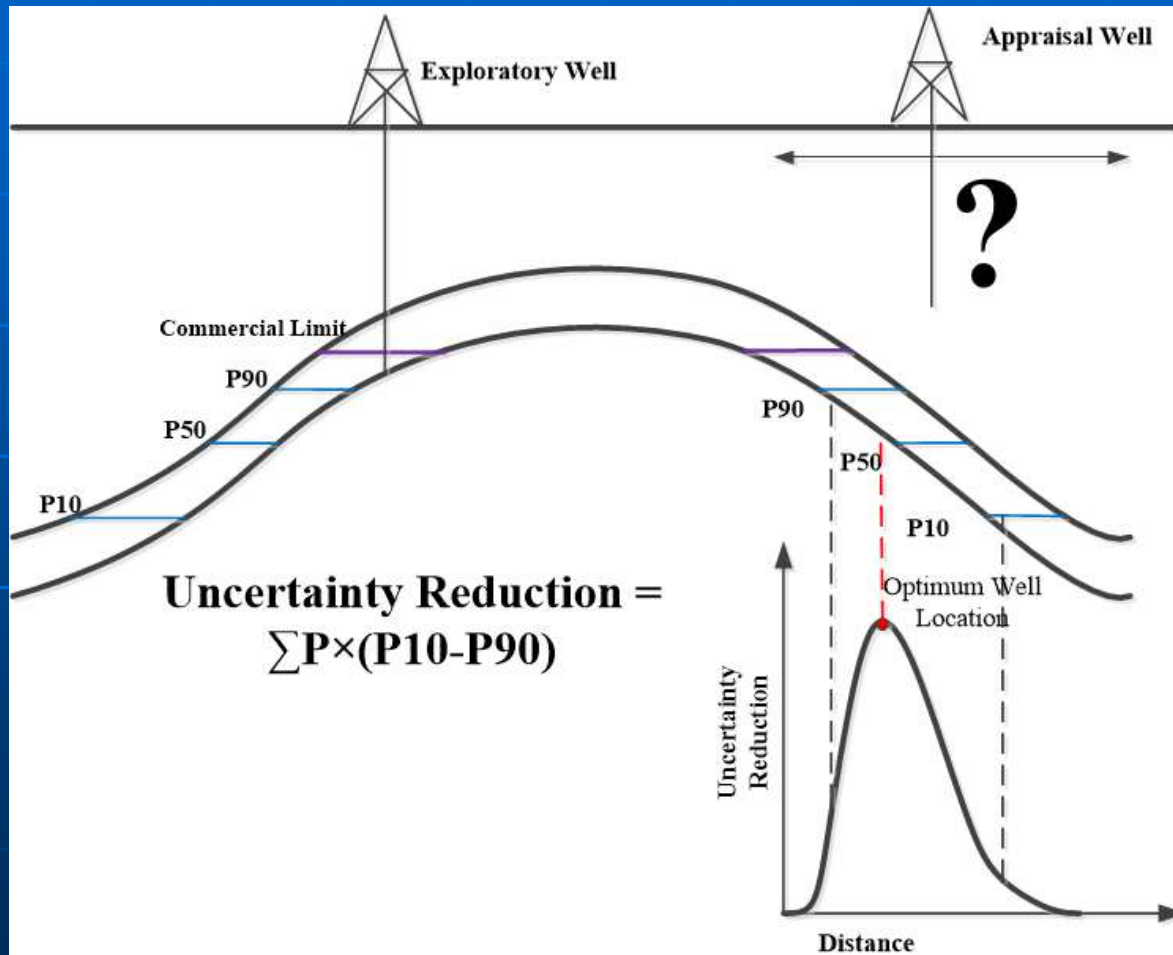
# Appraisal Well Location



- Drill near to P50 WOC
- Both if the well is fail or succeed the uncertainty reduction is significant!

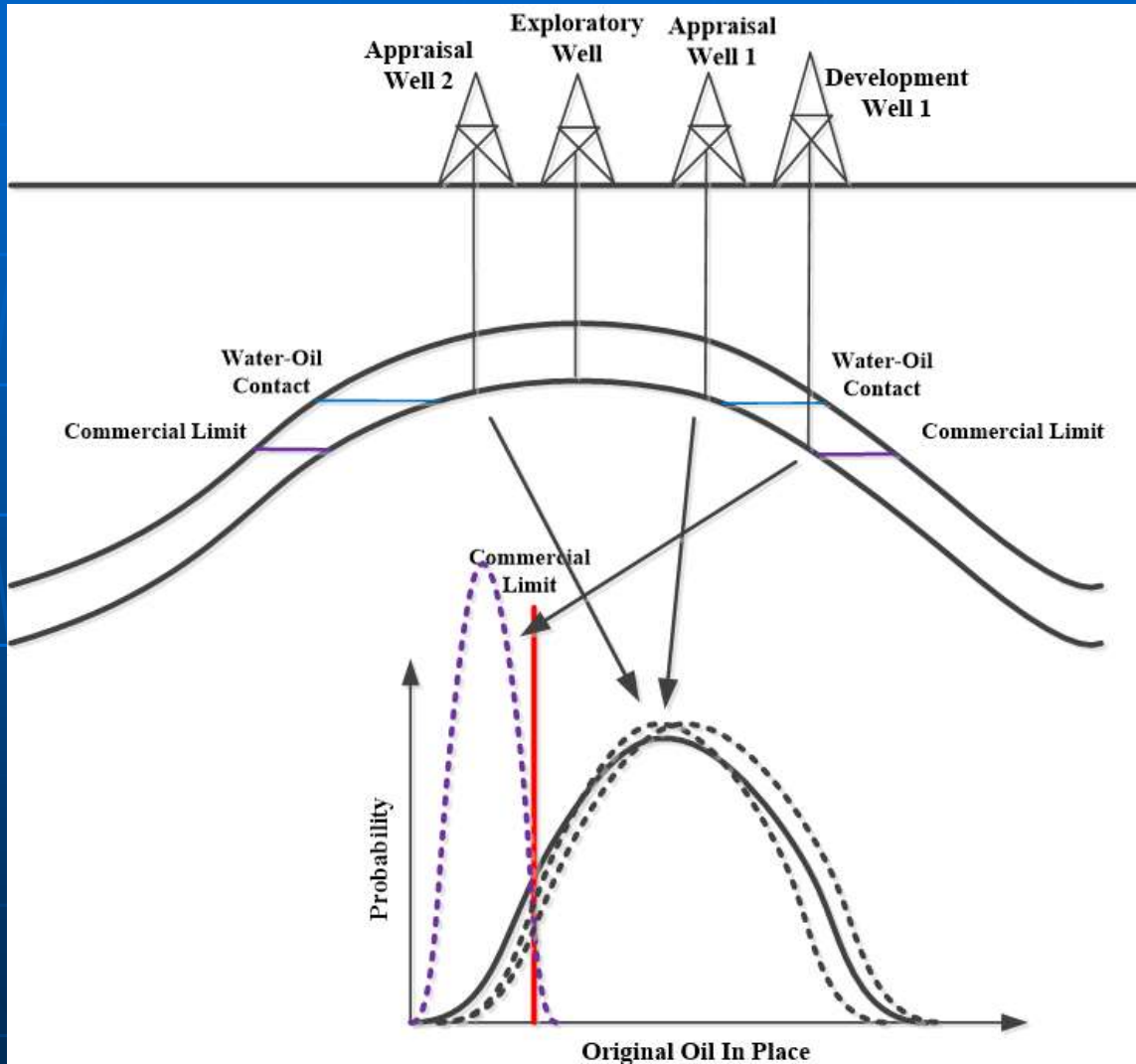


# Optimal Well Placement



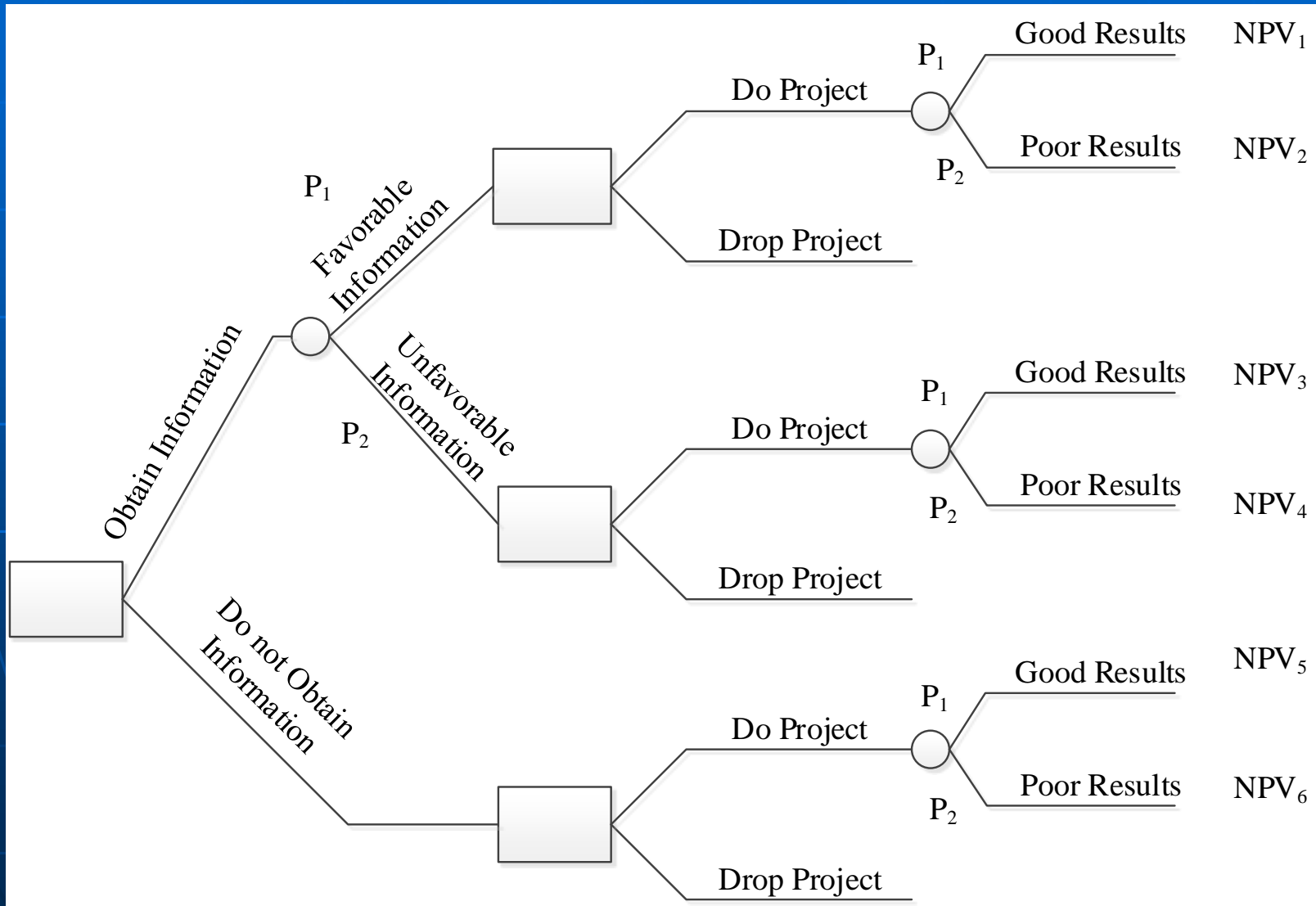
- Efficient Uncertainty Reduction
- Several other algorithms can be found in the literature

# What usually happened in the past

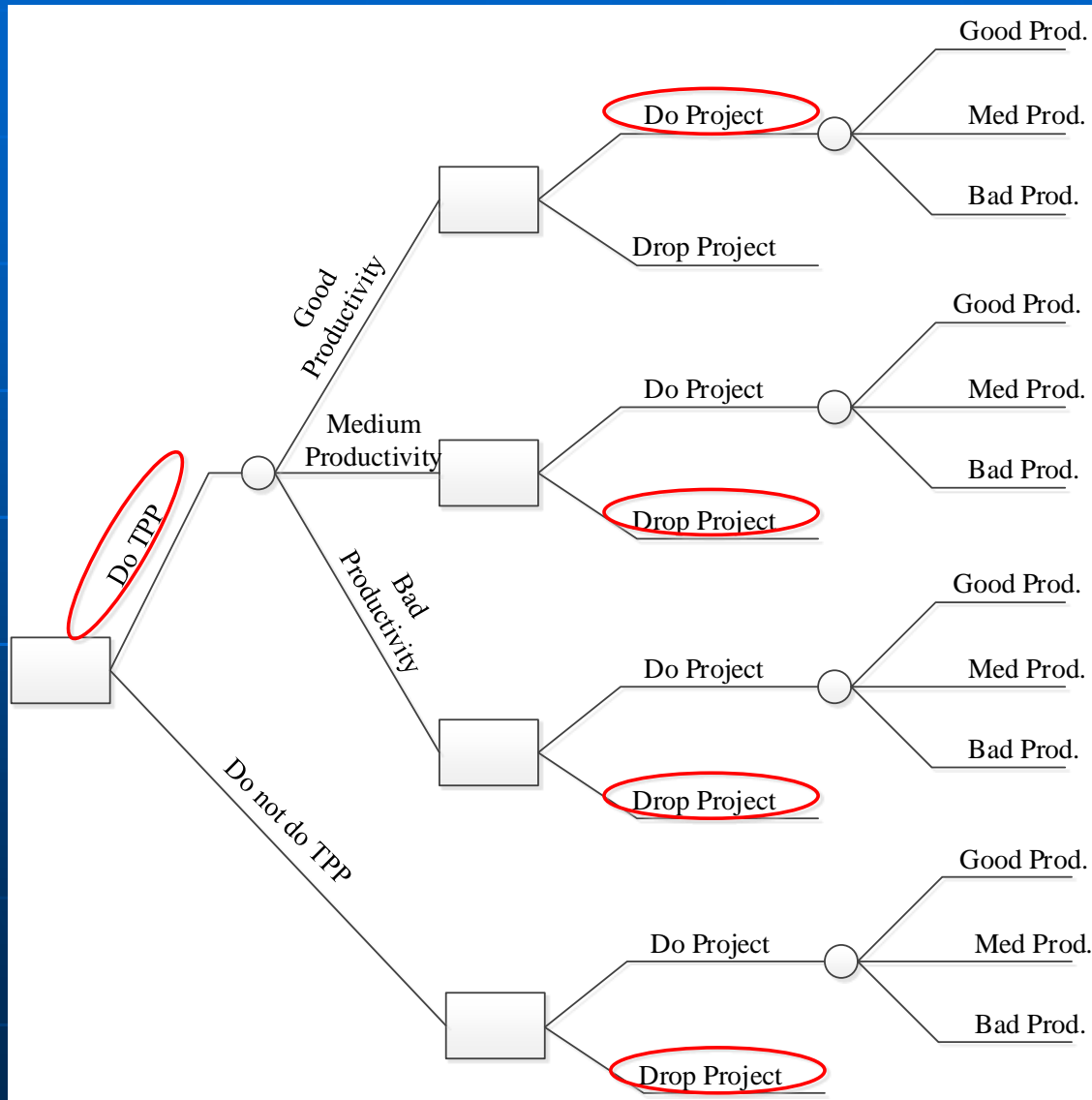


- Unfortunately many people still think that this comes from the nature of the business
- But it is simply stupid...

# Value of Information

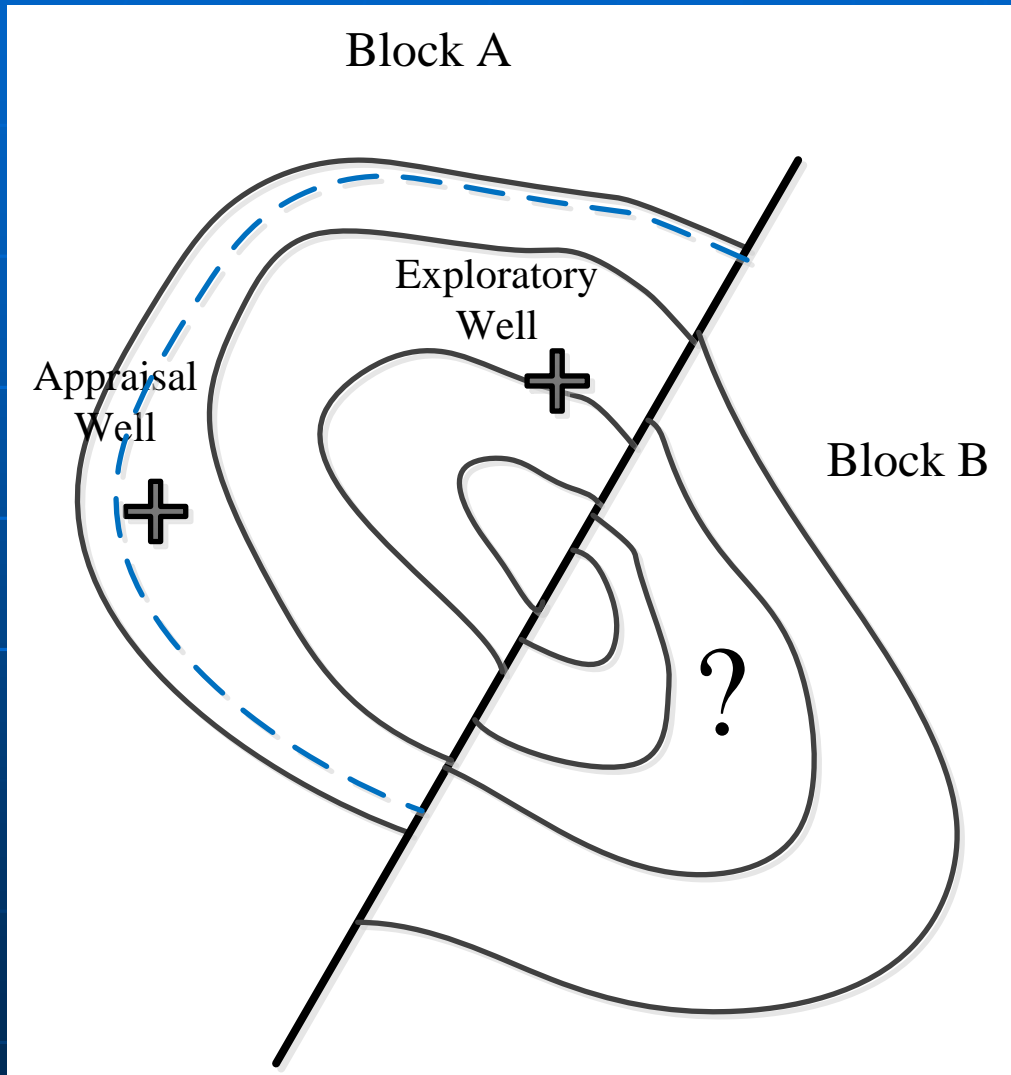


# Value of Information Example



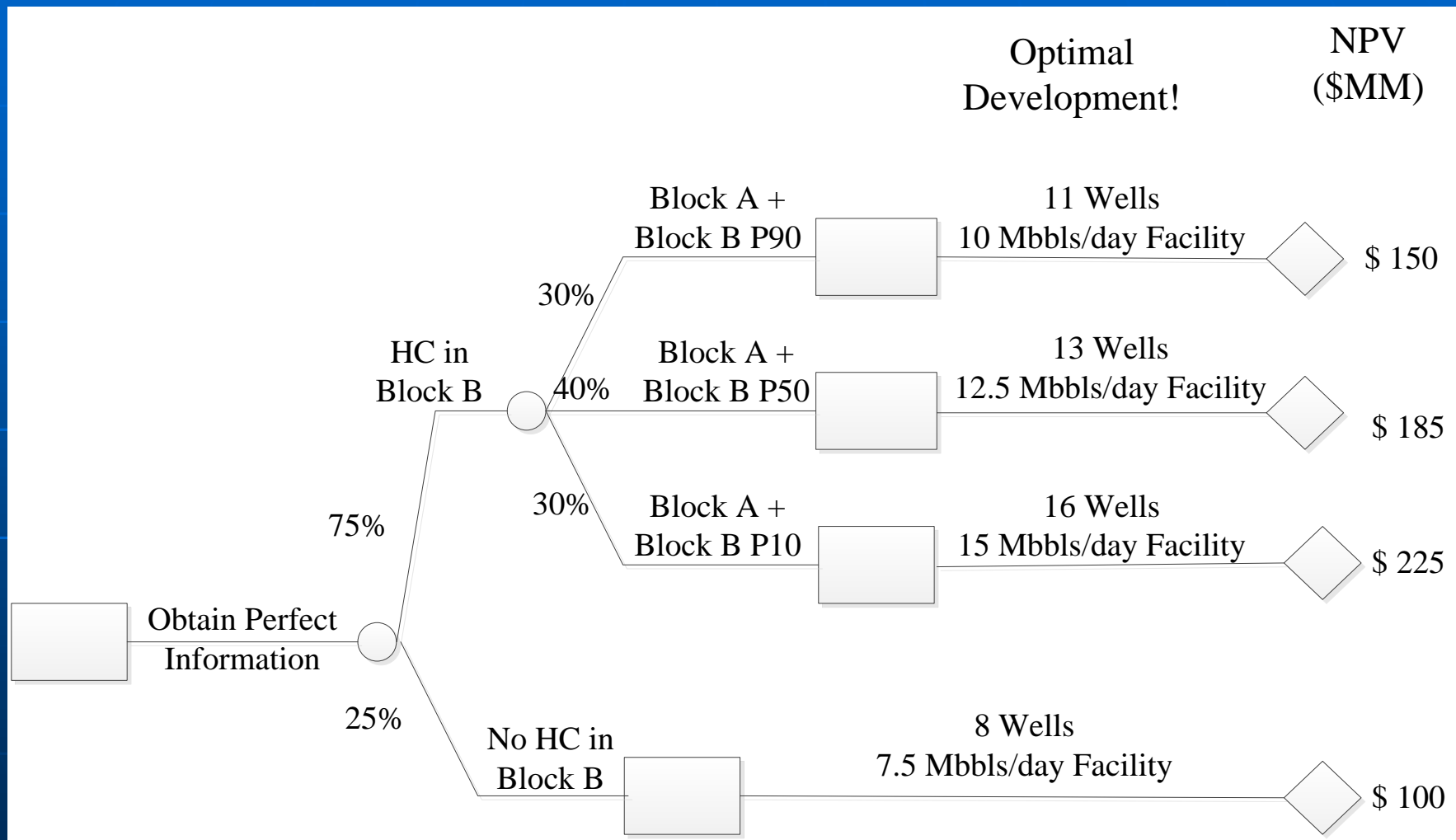
- Best way to justify measurements
- Information gathering programs can involve significant indirect costs
- Good risk register is necessary to give a reasonable estimate of probabilities

# Field Development



- Continue Appraisal or Start Development?
- Development Strategy & Facility Size?

# Perfect Information



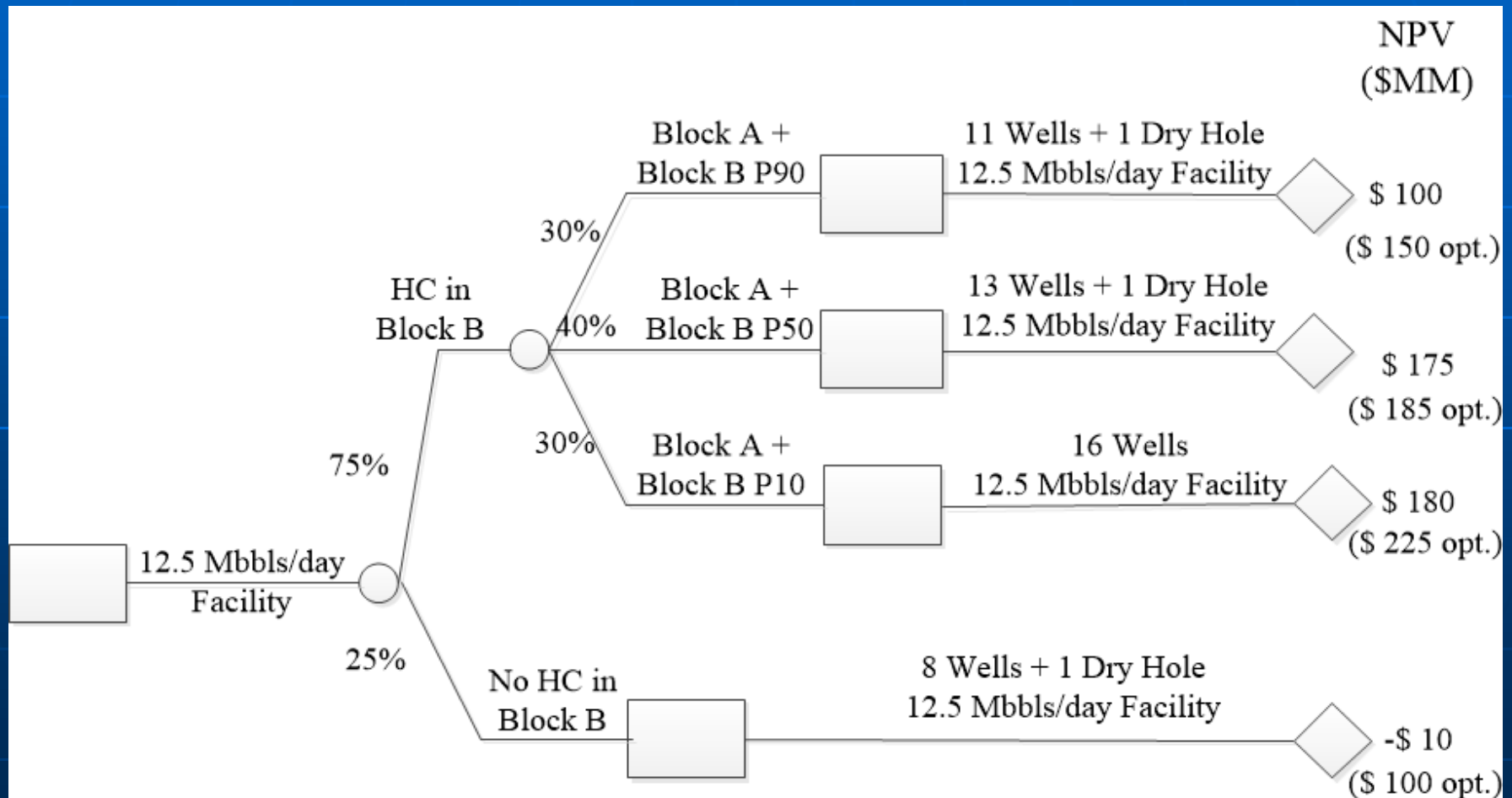


# Imperfect Information & Development Strategy Selction

- Usually the decisions must be made without perfect information
- The performance of every meaningful development option should be tested
- In this case there are several option for the size of the surface facility. Develop block B or not?. If the facility seems to be small, it can be enlarged later in case of onshore field.
- Several economic merits can be used for making the final decision

# Imperfect Information & Development Strategy Selection

- EMV = 113 \$MM

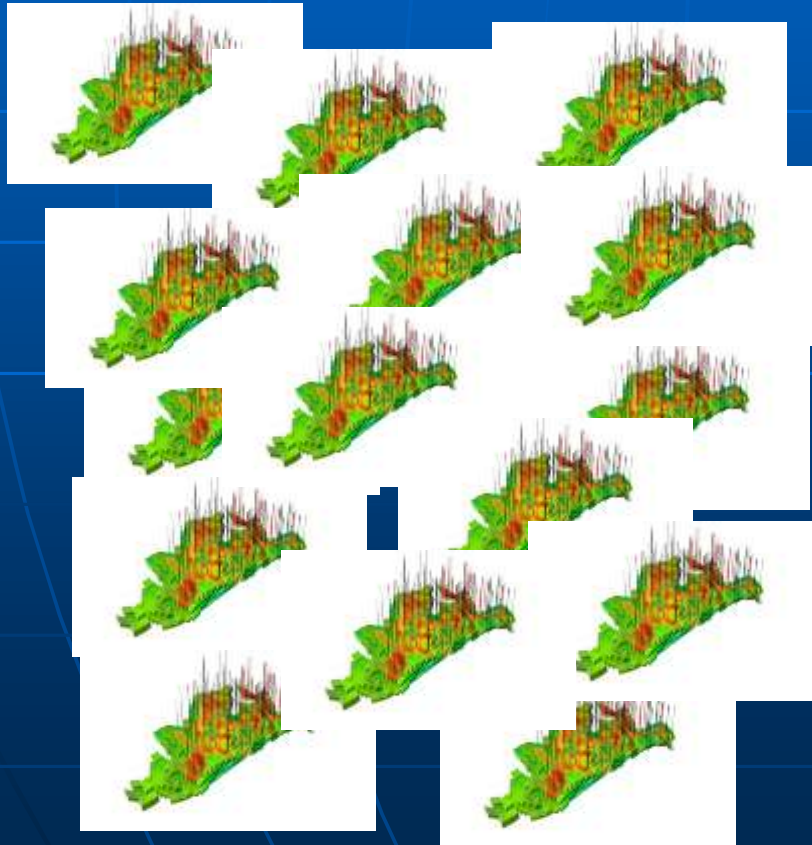


# Way Forward

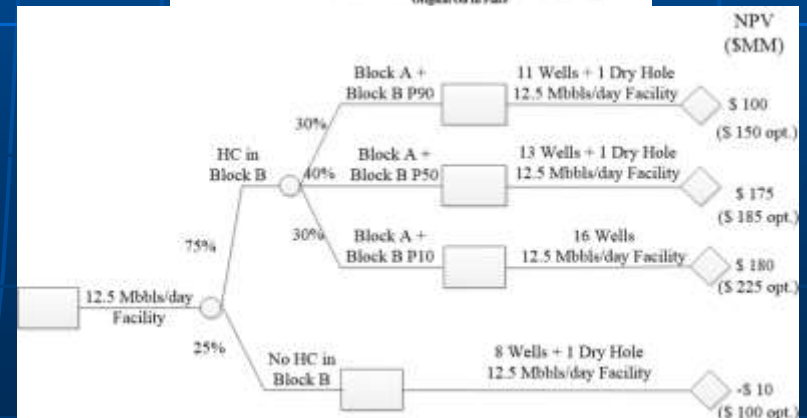
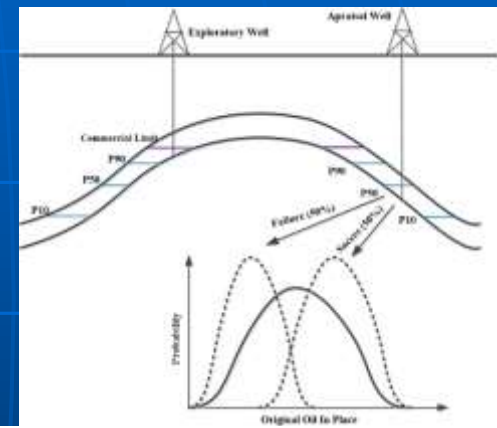
- Decision mapping is an enhanced version of VOI
- Conditional field development is available in most of the reservoir simulators
- Integration from seismics to cash flow calculations

# Comparison

- Which would you prefer as decision maker?



VS.



# Summary & Conclusion

- Uncertainty assessment is important
- But only helpful if it is prepared in the proper way for a certain objective
- Several concepts were introduced without the shake of completeness
- Better planning of appraisal and field development will be a key issue, since we cannot afford another failure when the oil price is only 40-50 \$/bbls

# Thank You for Your Attention!