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Distinguished Lecturer Program

Making better Appraisal & Development Decisions Using Decision Risk Analysis & Value of Information

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The logo for BG Group, consisting of the letters 'bg' in white on an orange square background.

Aims of this presentation

- To introduce Decision Risk Analysis (DRA)
- To provide an understanding of 'value of information' (VOI) analysis
 - When?
 - Why?
 - How?

What is Decision Risk Analysis?

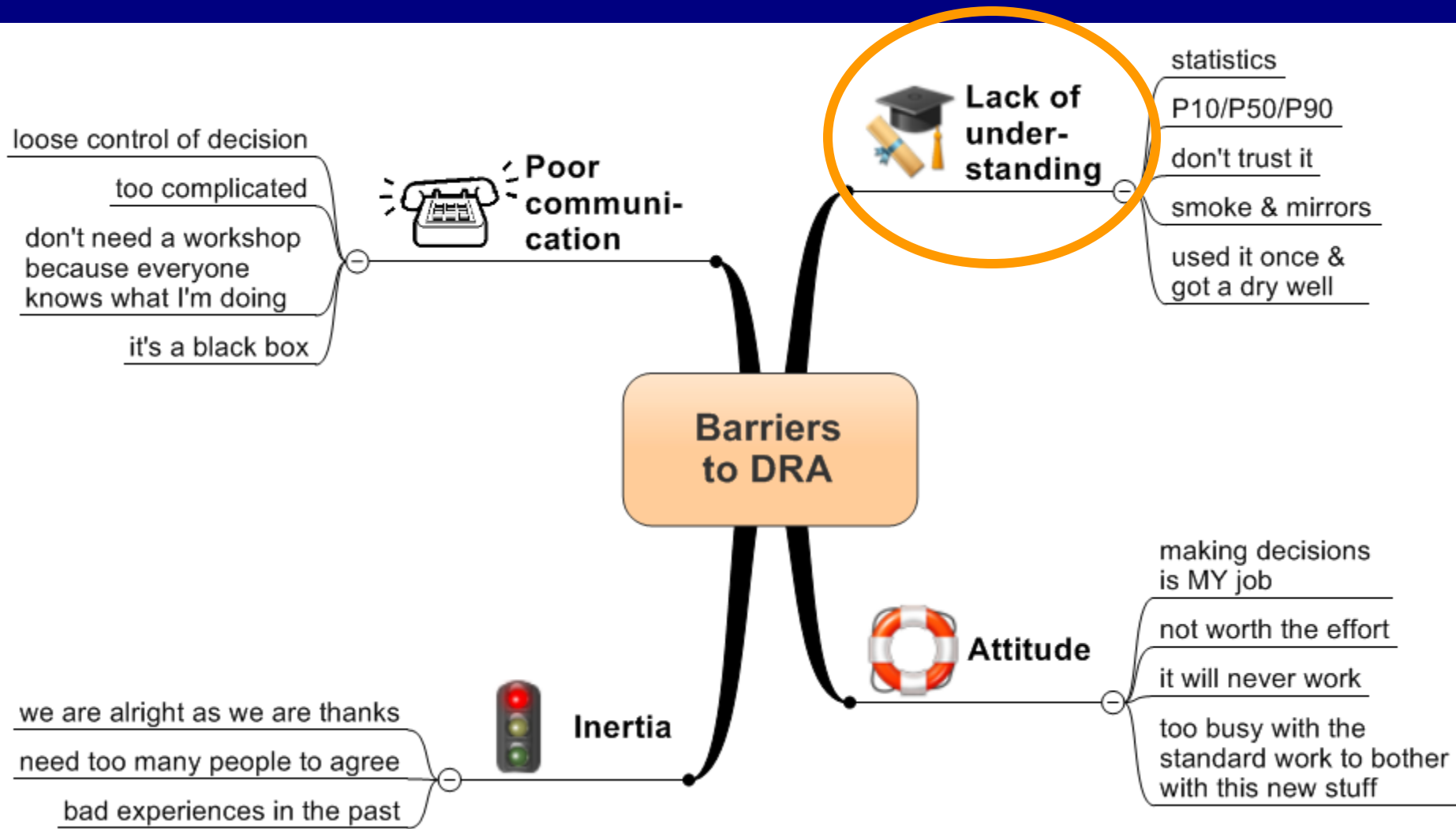
- A structured process to help stakeholders optimise their decision making in the face of risks & uncertainties
- Involves a combination of
 - Facilitation
 - Modelling
- Term first used by Ron Howard in 1966

What is Decision Risk Analysis?

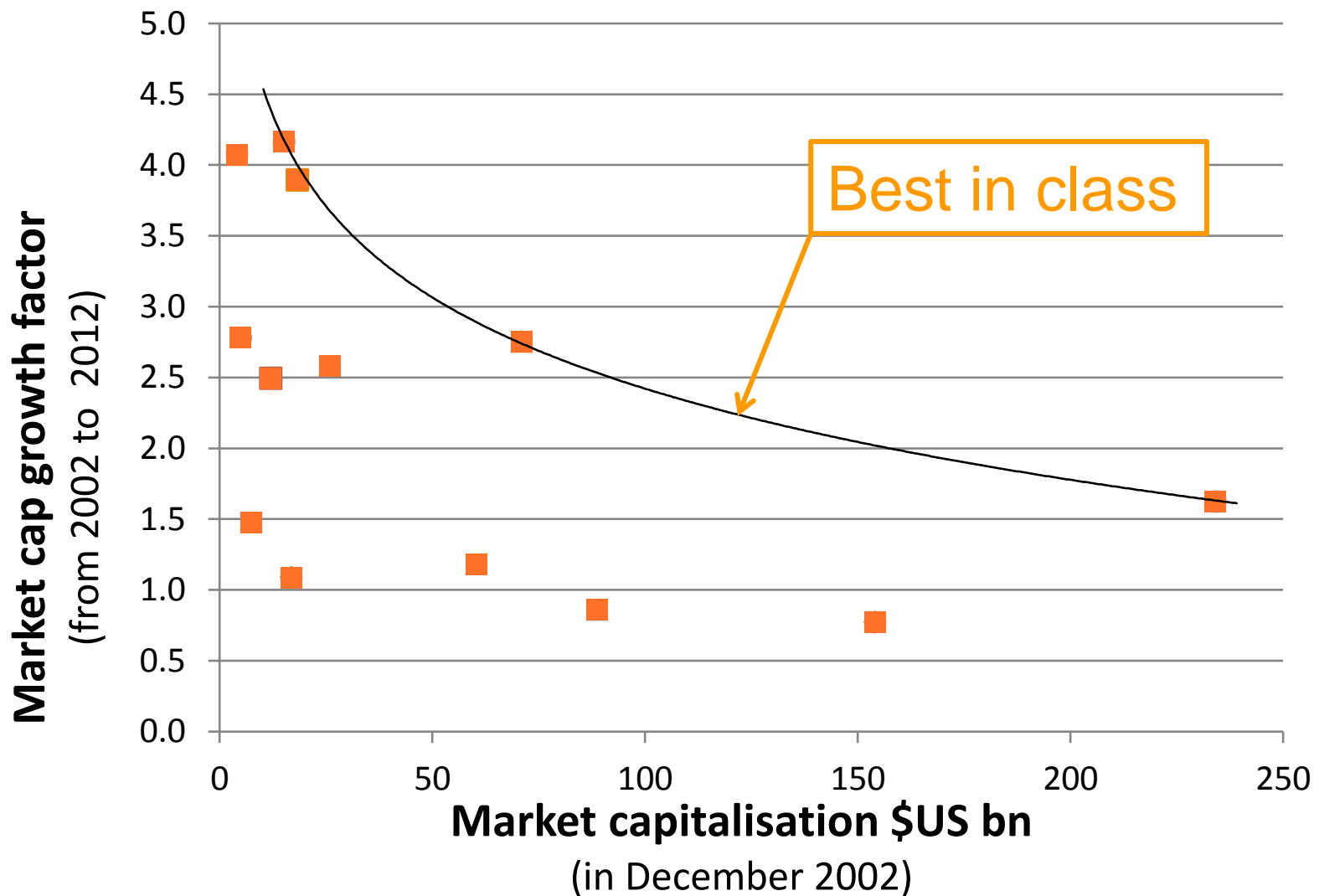
- A structured process to help stakeholders **optimise** their decision making in the face of risks & uncertainties
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- Term first used by Ron Howard in 1966

Why is DRA not used more widely?

Barriers to using DRA



How can you deliver superior performance...?

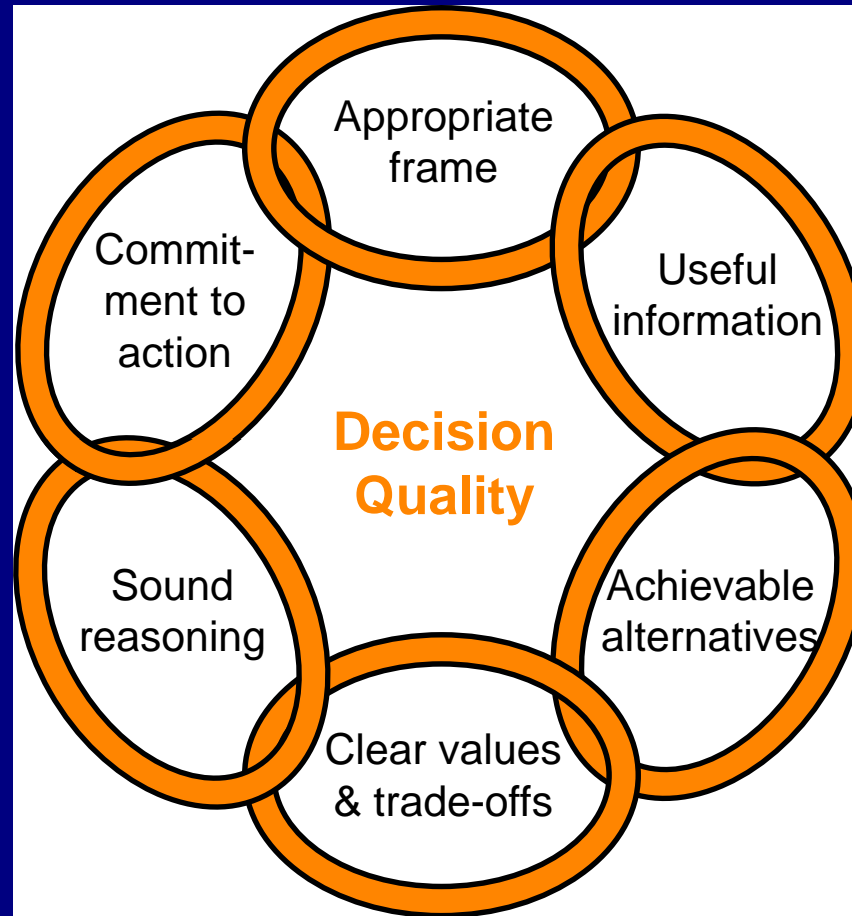


...focus on delivering Decision Quality

A great answer to the wrong question is useless

Secure consensus amongst stakeholders

Too complex for intuition?




Allow for risks & uncertainties correctly

If there is only one choice then there is no decision

Eg: early production vs NPV

A range of decision making approaches are available

- Voting
 - Threat/benefit log
 - Weighted ranking
 - Absolute ranking
 - Probability x impact ranking
 - Cost/schedule risking
 - **Value of information analysis**
 - Fully integrated asset modelling
- Qualitative
- 
- Quantitative

When might VOl analysis be valuable?

- Facing multiple decision options
- Outcomes are uncertain
- Opportunity to acquire additional information
- Information costs money and/or time

Is the additional information worth the cost?

Why might VOl analysis be valuable?

- The additional information might reduce future uncertainties
- The best decision option might change in the light of the new information

If no decisions change, think carefully about acquiring the new information

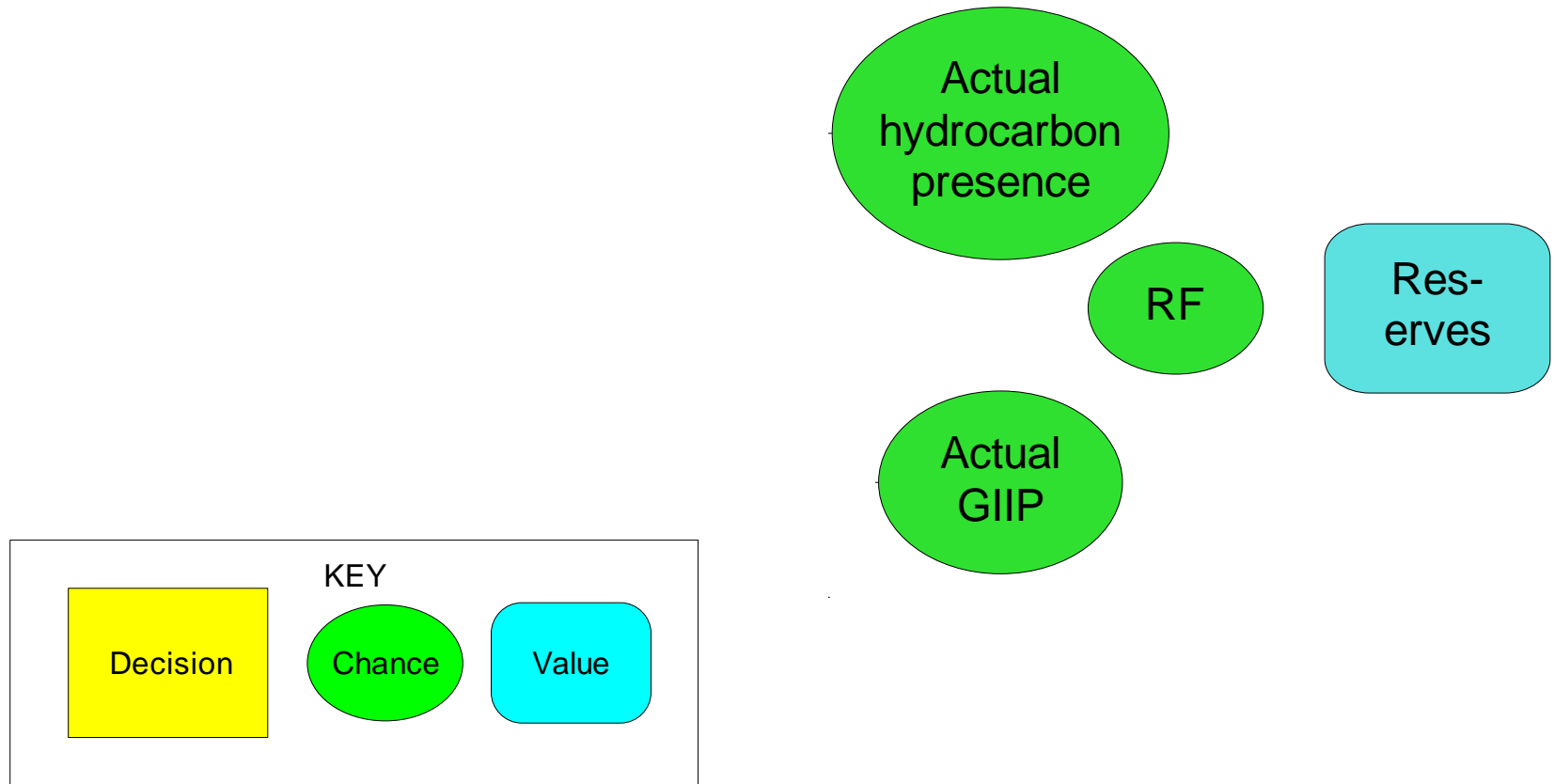
Key questions

- How much does the information cost?
 - Acquisition, analysis, delay to development
- How reliable is the information?
 - Will the measurement fail?
 - False results (imperfect information)?
- How useful is the information?
 - How significant is the parameter(s)?
 - What difference will the information make?

How do I undertake a VOl analysis?

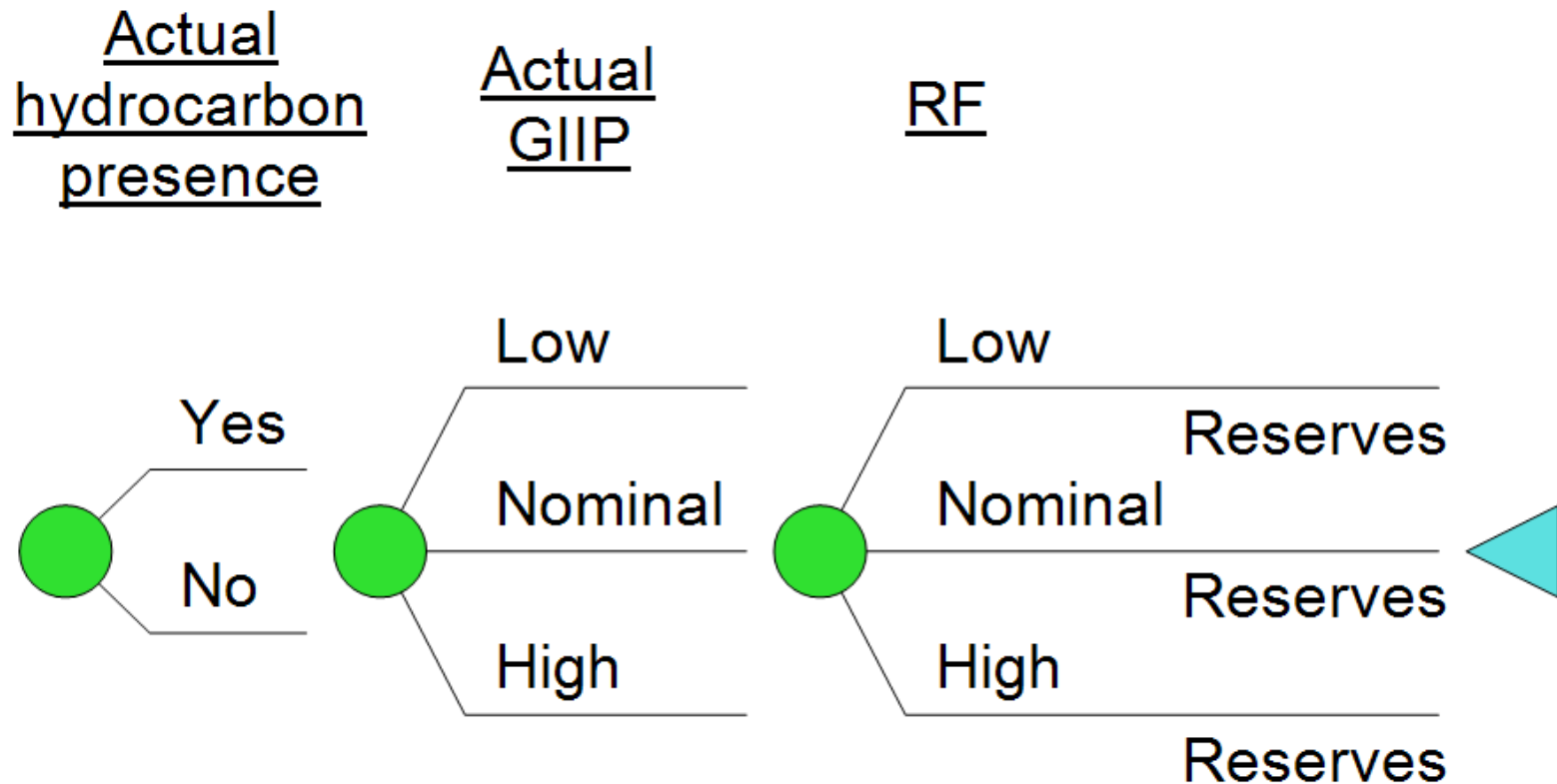
- Case example
 - Should an appraisal well be drilled in the North Extension?
 - Should the North Extension be developed?
- A new user took < two hours to learn the software & complete this analysis

Influence diagram



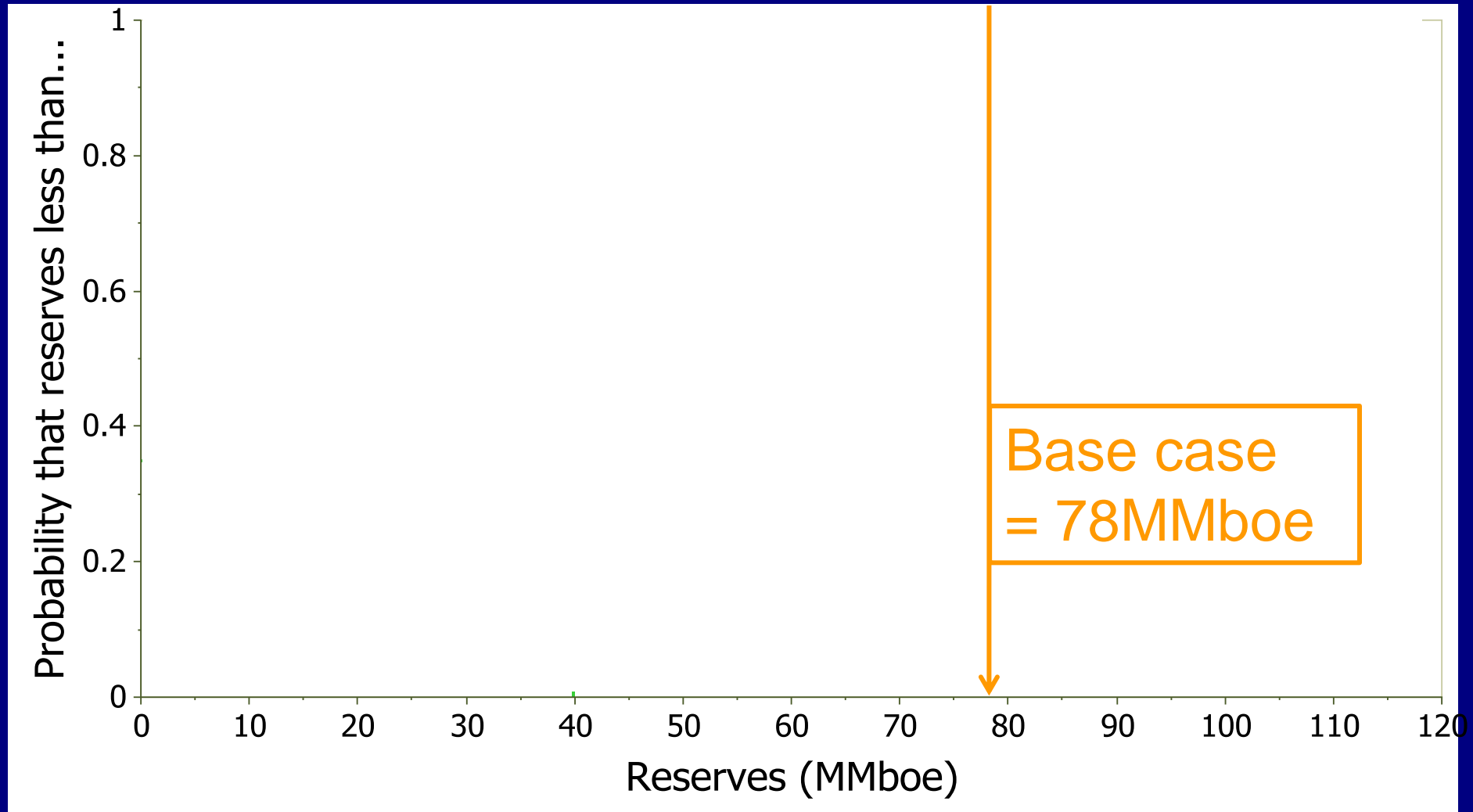
Lays out the components of the frame

Decision tree



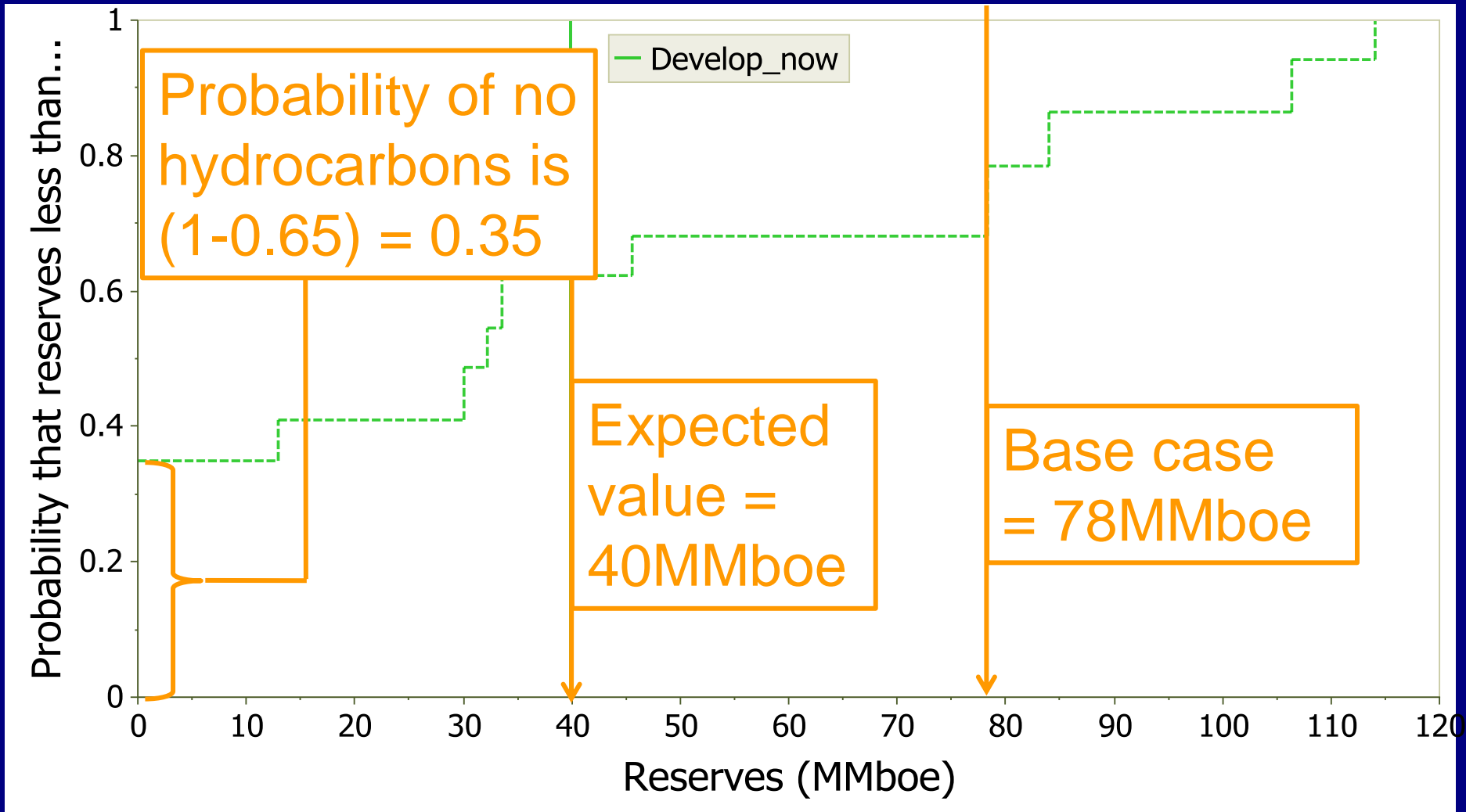
$$\text{Reserves} = \text{Presence} * \text{GIIP} * \text{Recovery Factor}$$

Base case: reserves for North Extension



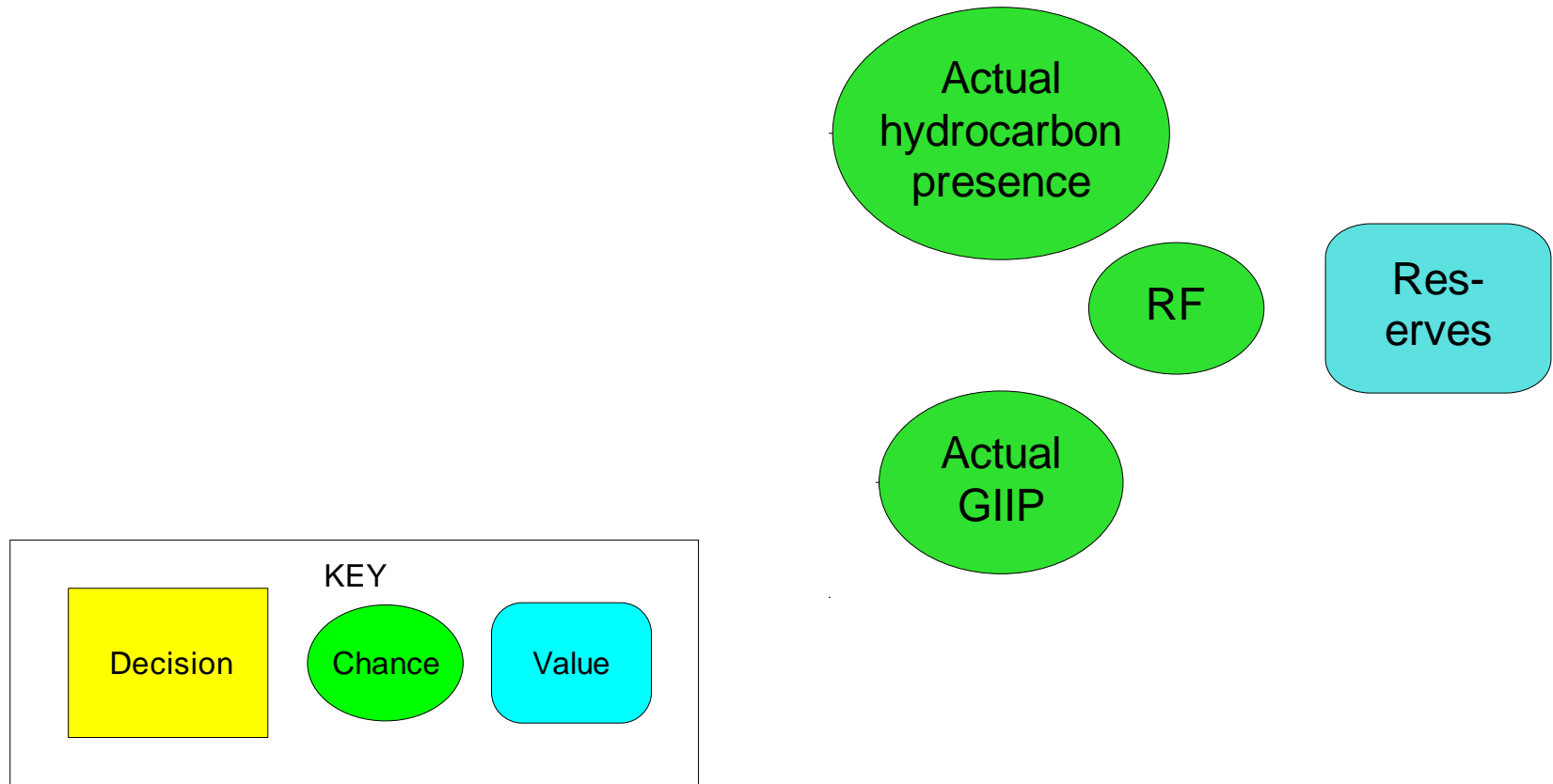
This should not be the basis of your business case 16

Risk profile: reserves for North Extension

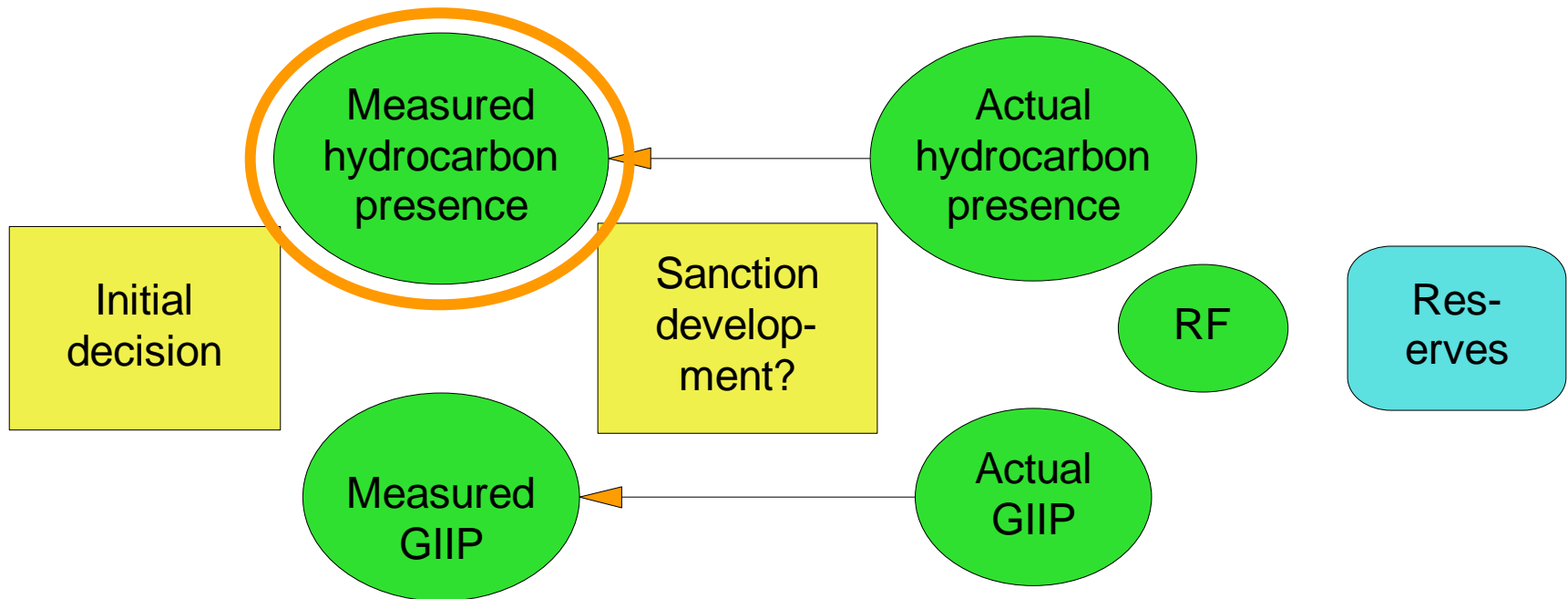


Illustrates the range of possible reserves

Influence diagram

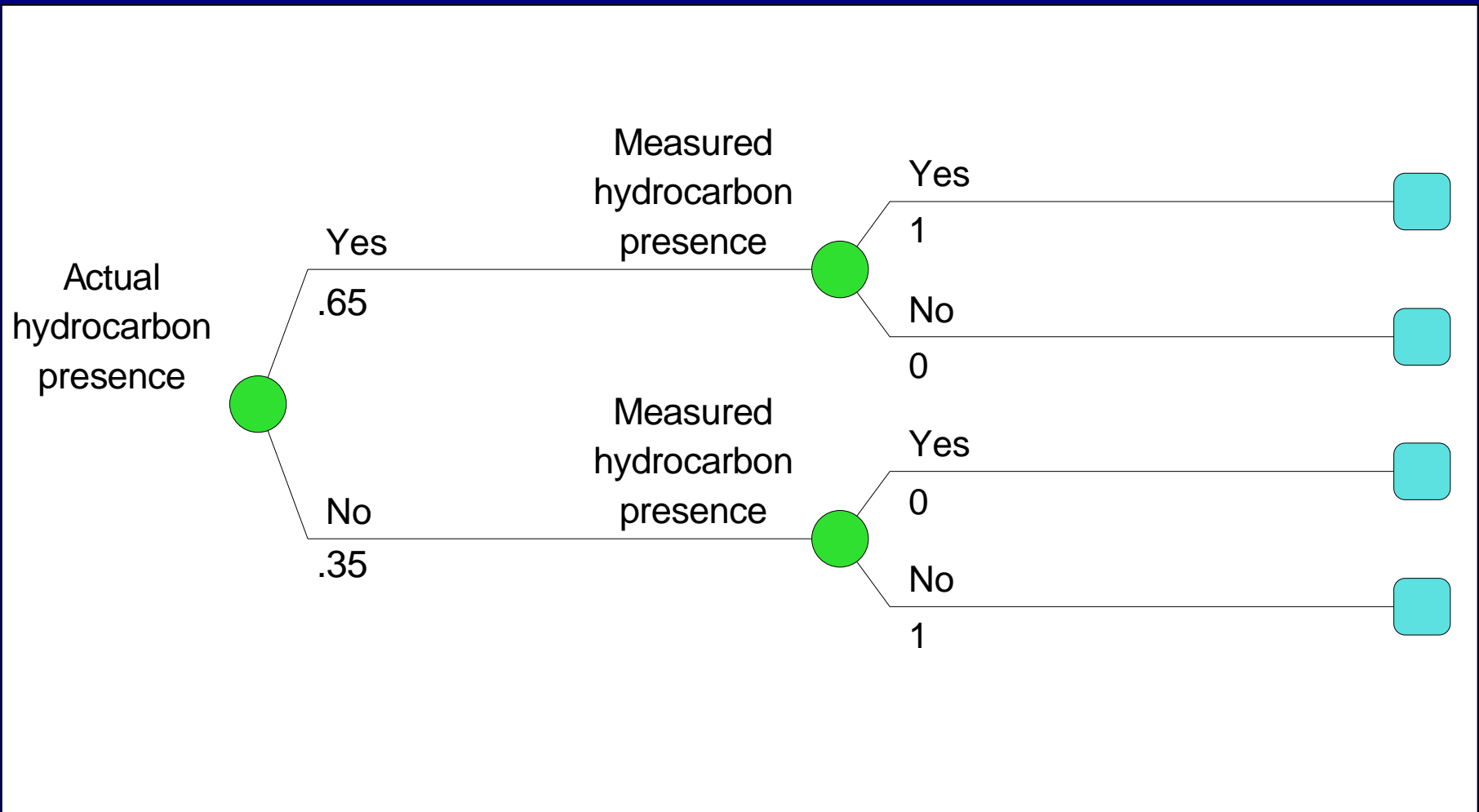


Influence diagram extended to include appraisal



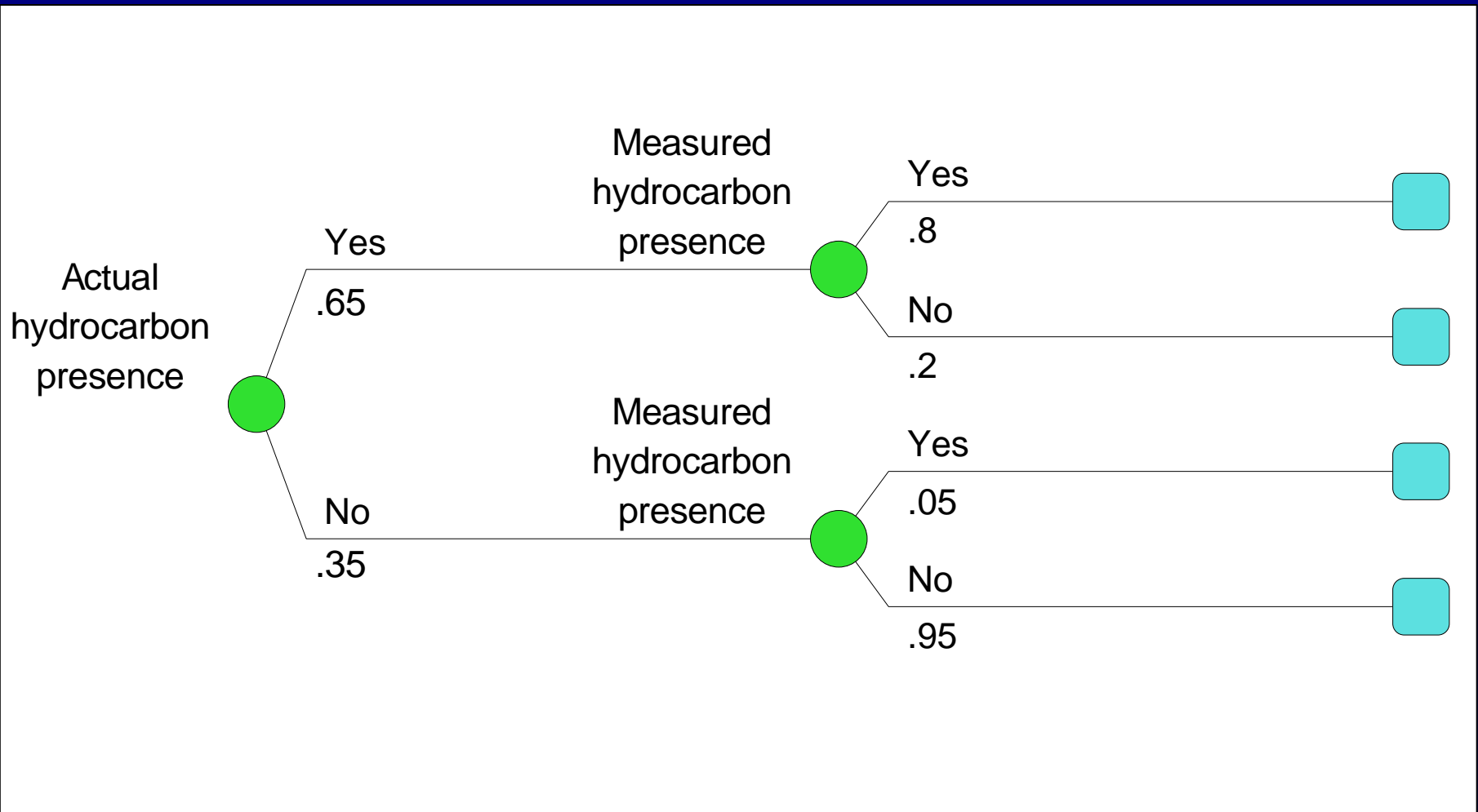
Measured HCP depends on actual state of nature

Conditional probabilities: hydrocarbon presence with perfect information



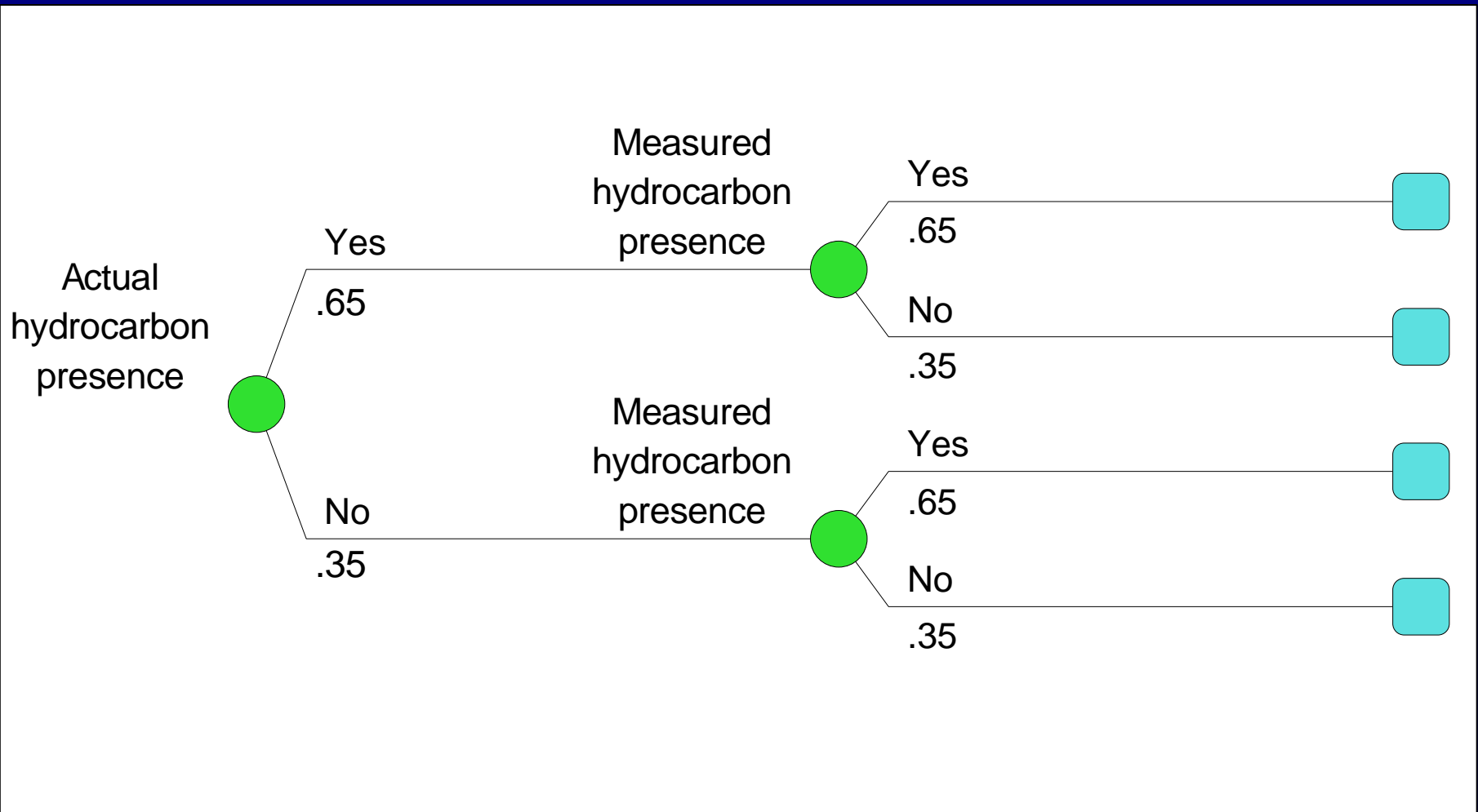
Captures the reliability of the measurement

Conditional probabilities: hydrocarbon presence with imperfect information



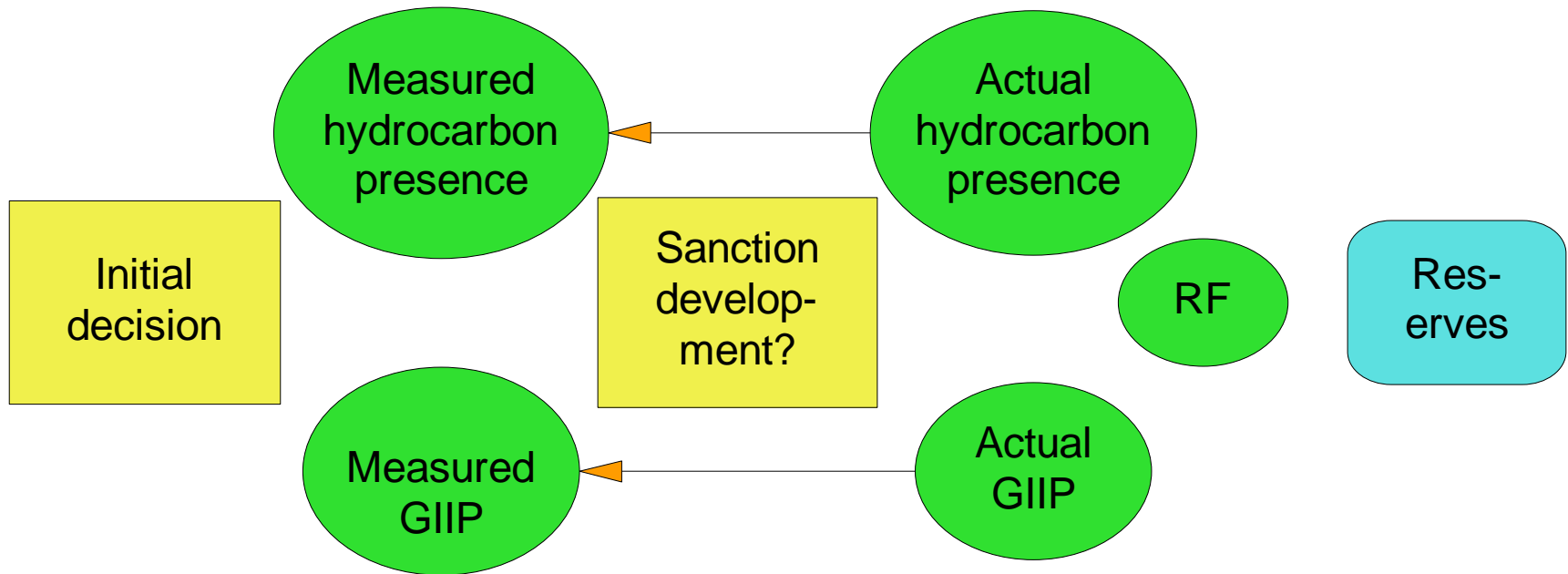
Captures the reliability of the measurement

Conditional probabilities: hydrocarbon presence with no information

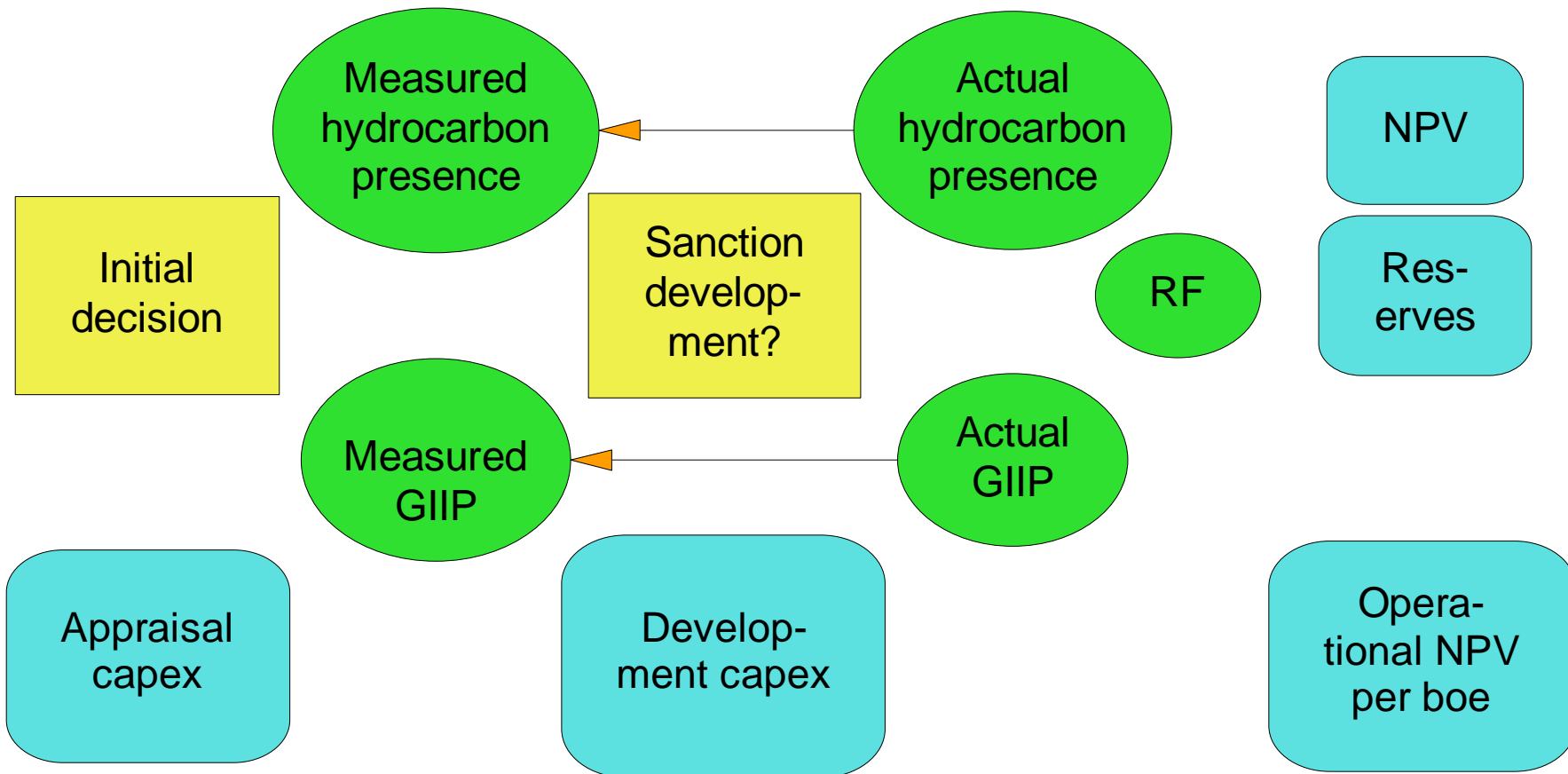


Captures the reliability of the measurement

Influence diagram



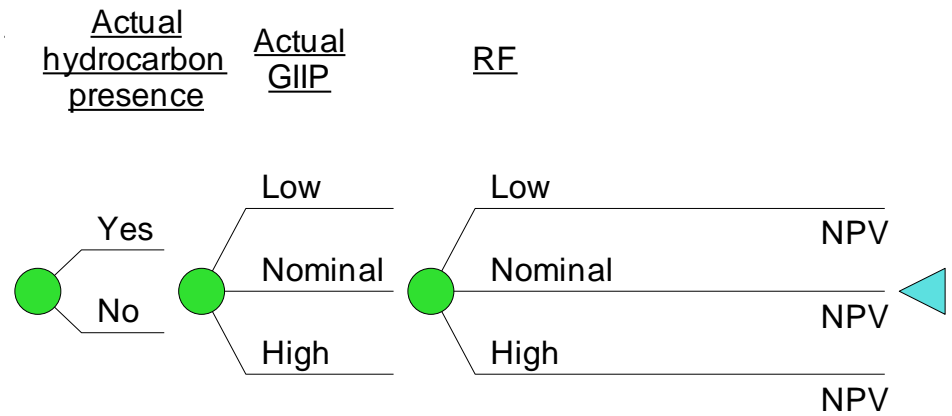
Influence diagram extended to include economics



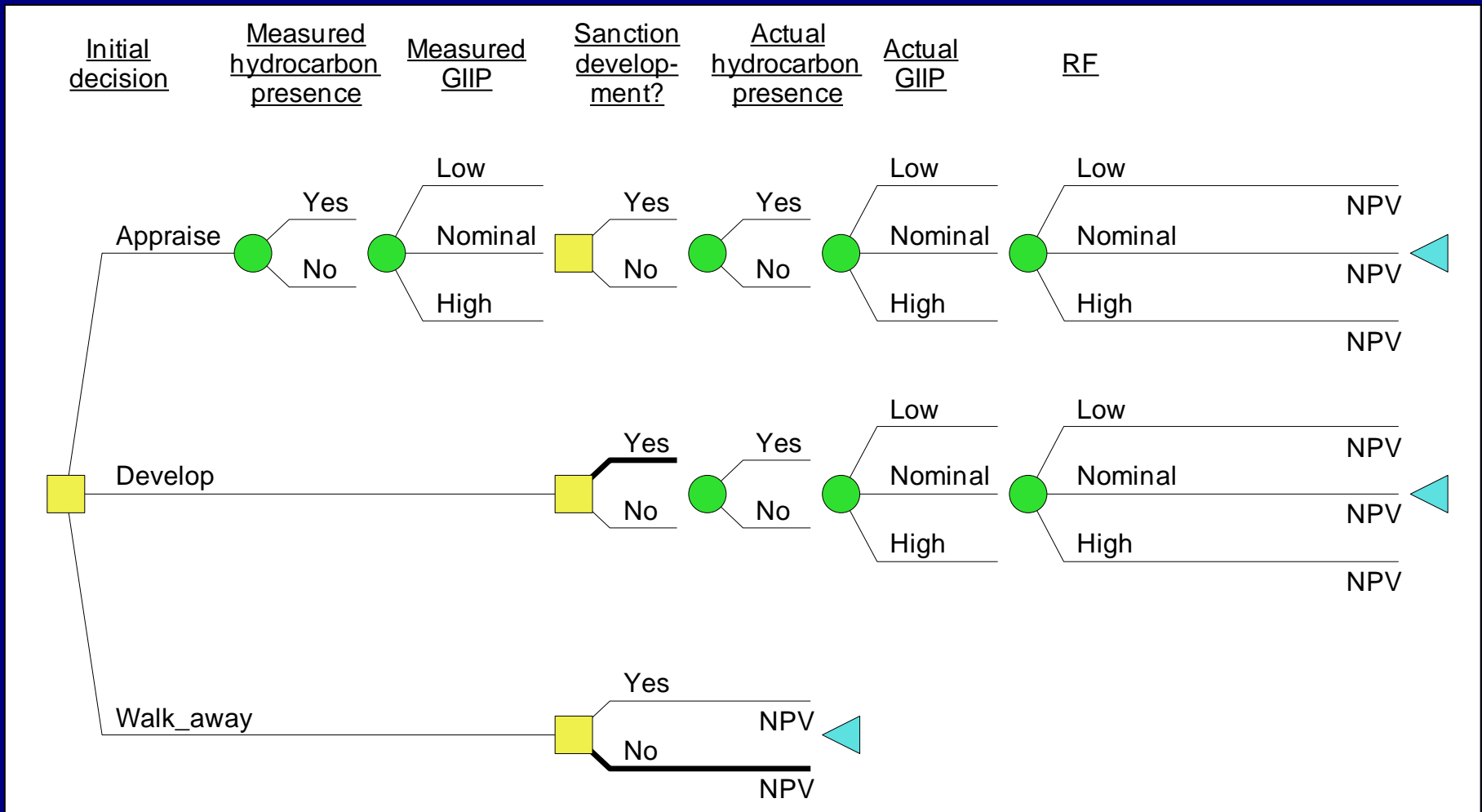
$$\text{Net Present Value} = \text{Reserves} * (\text{OpsNPV}/\text{boe}) - \text{capex}$$

Which decision options give the best NPV?

Decision tree

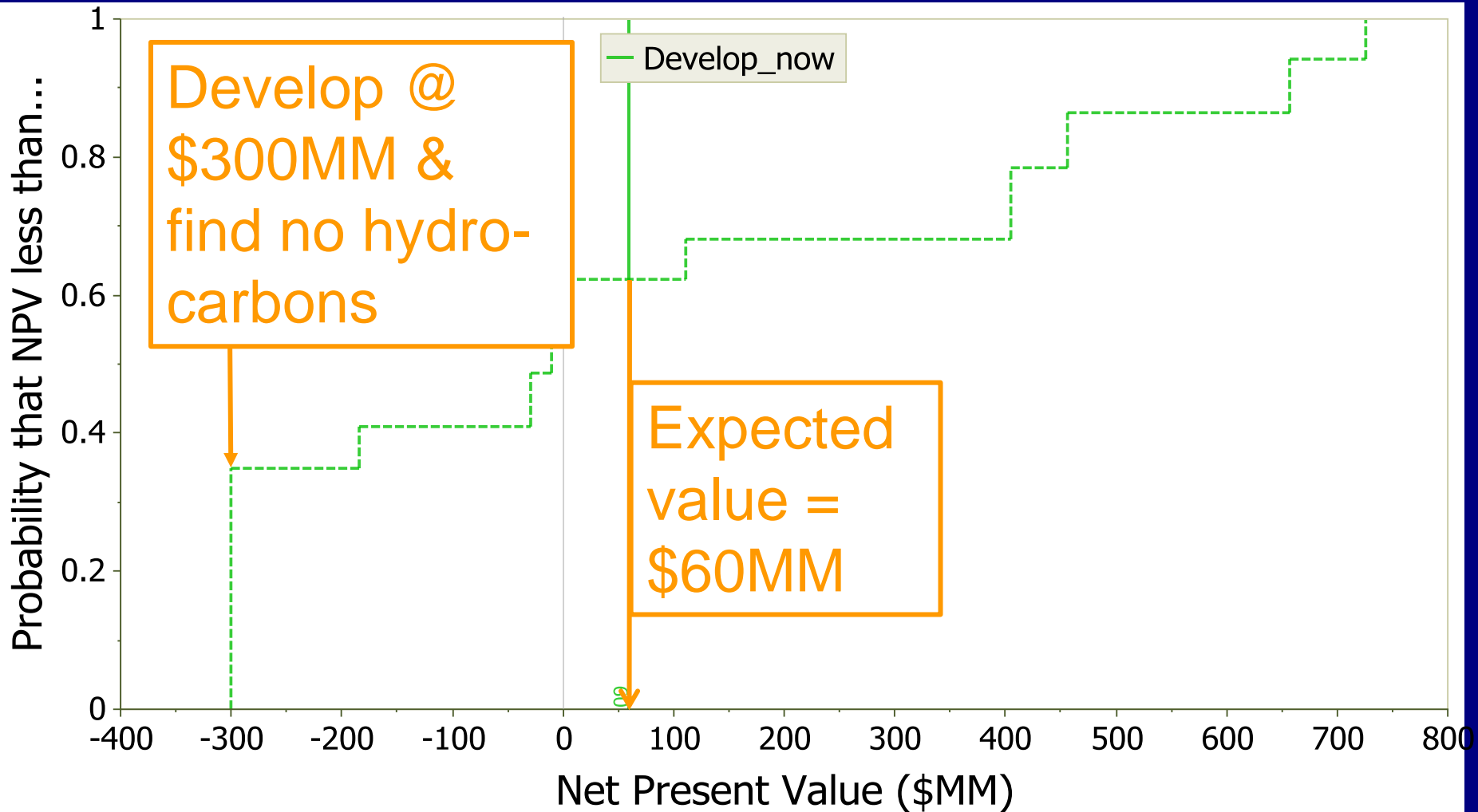


Decision tree extended to include appraisal



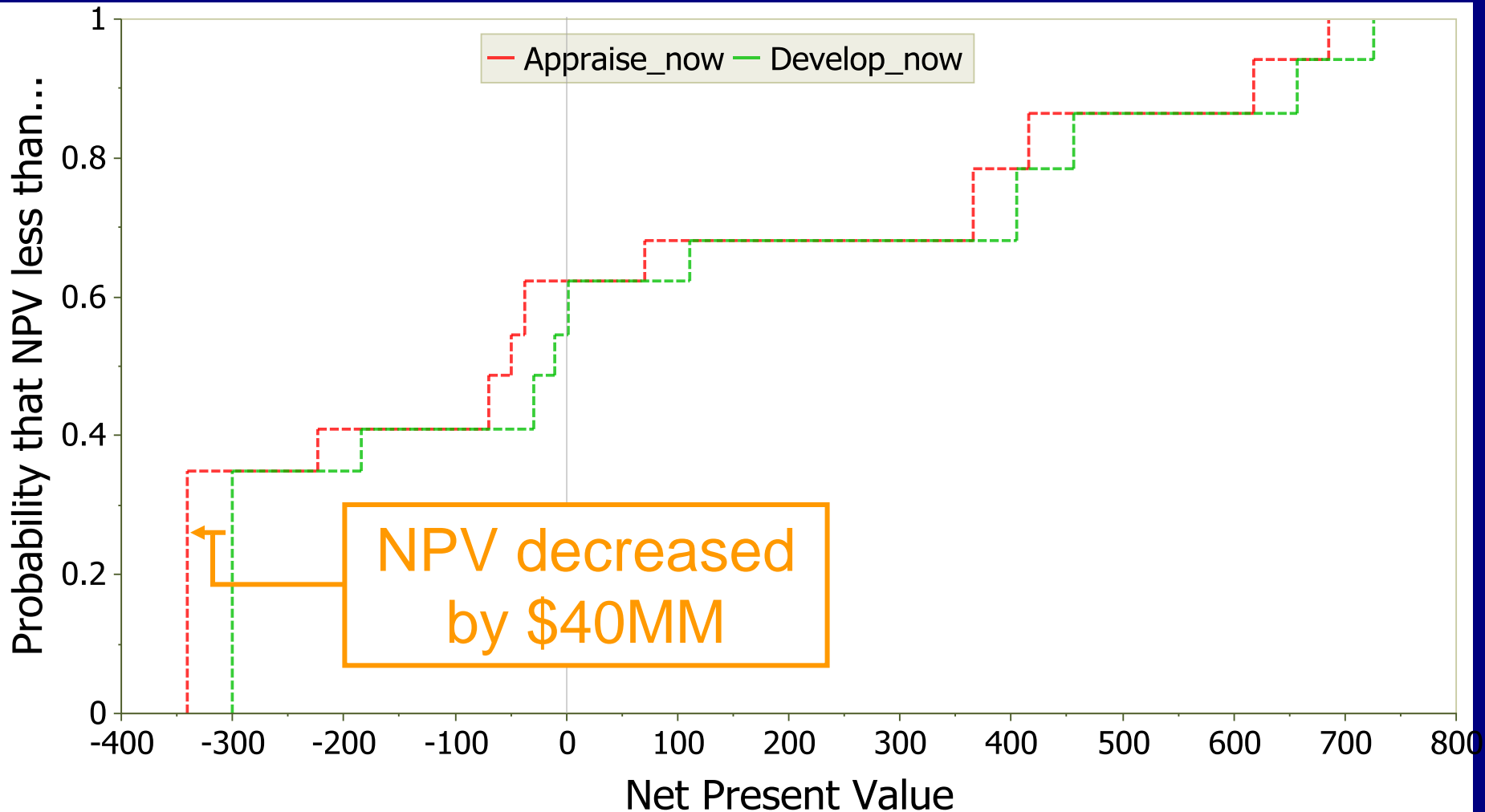
Captures the time order of events

NPV risk profile: develop now



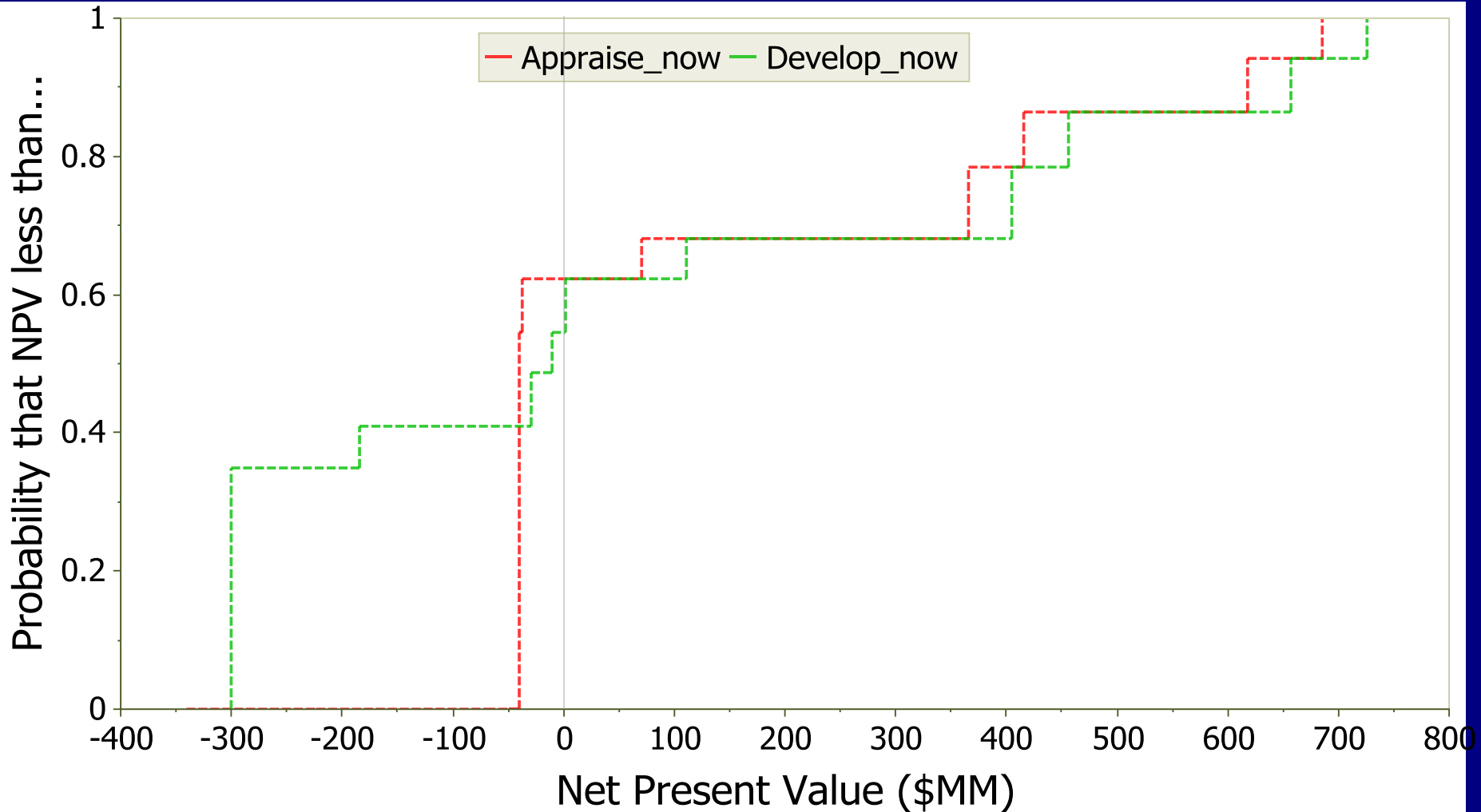
Illustrates the range of possible NPVs

NPV risk profile: appraise, no information



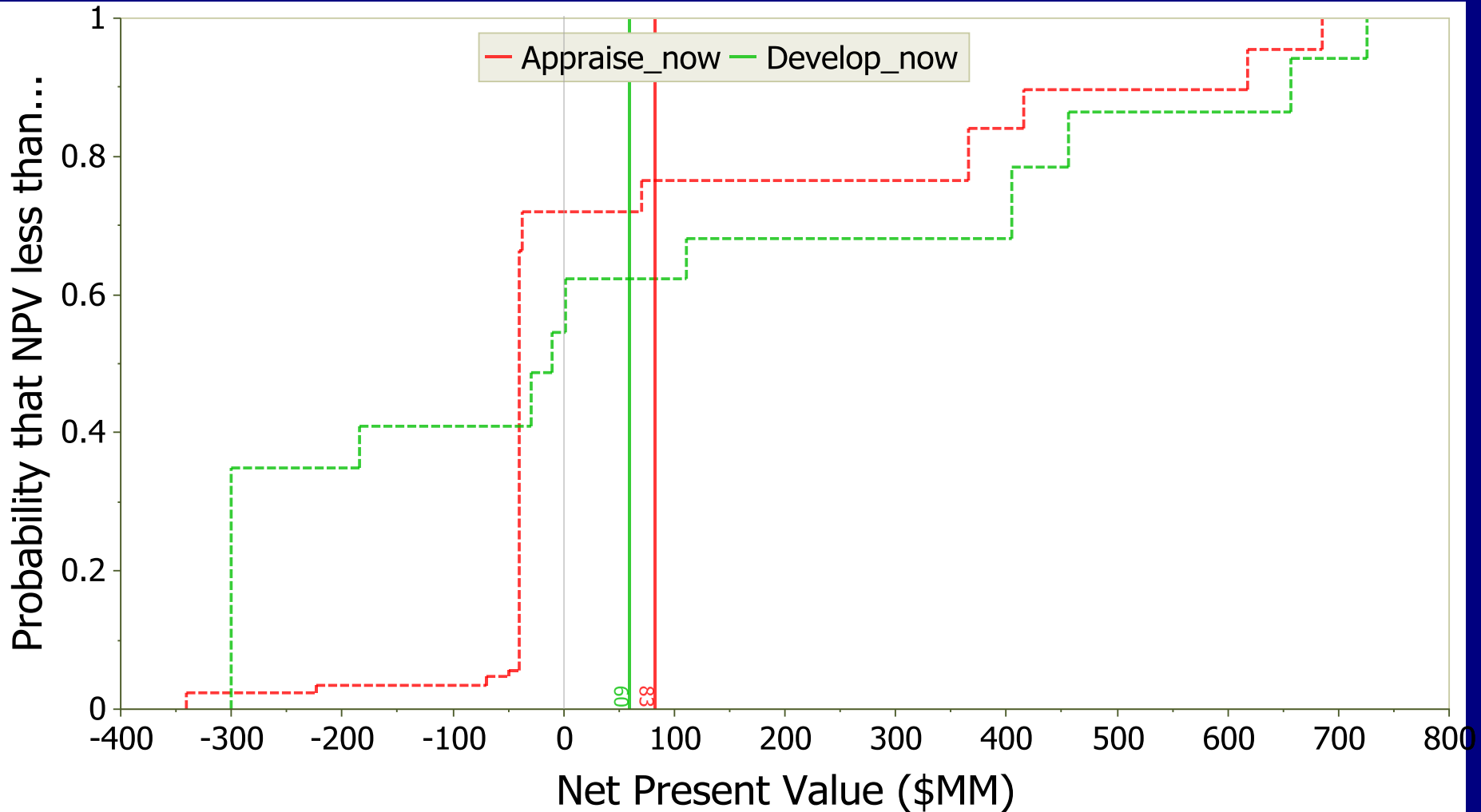
Spend \$40MM on appraisal but get no information

NPV risk profile: appraise, perfect information

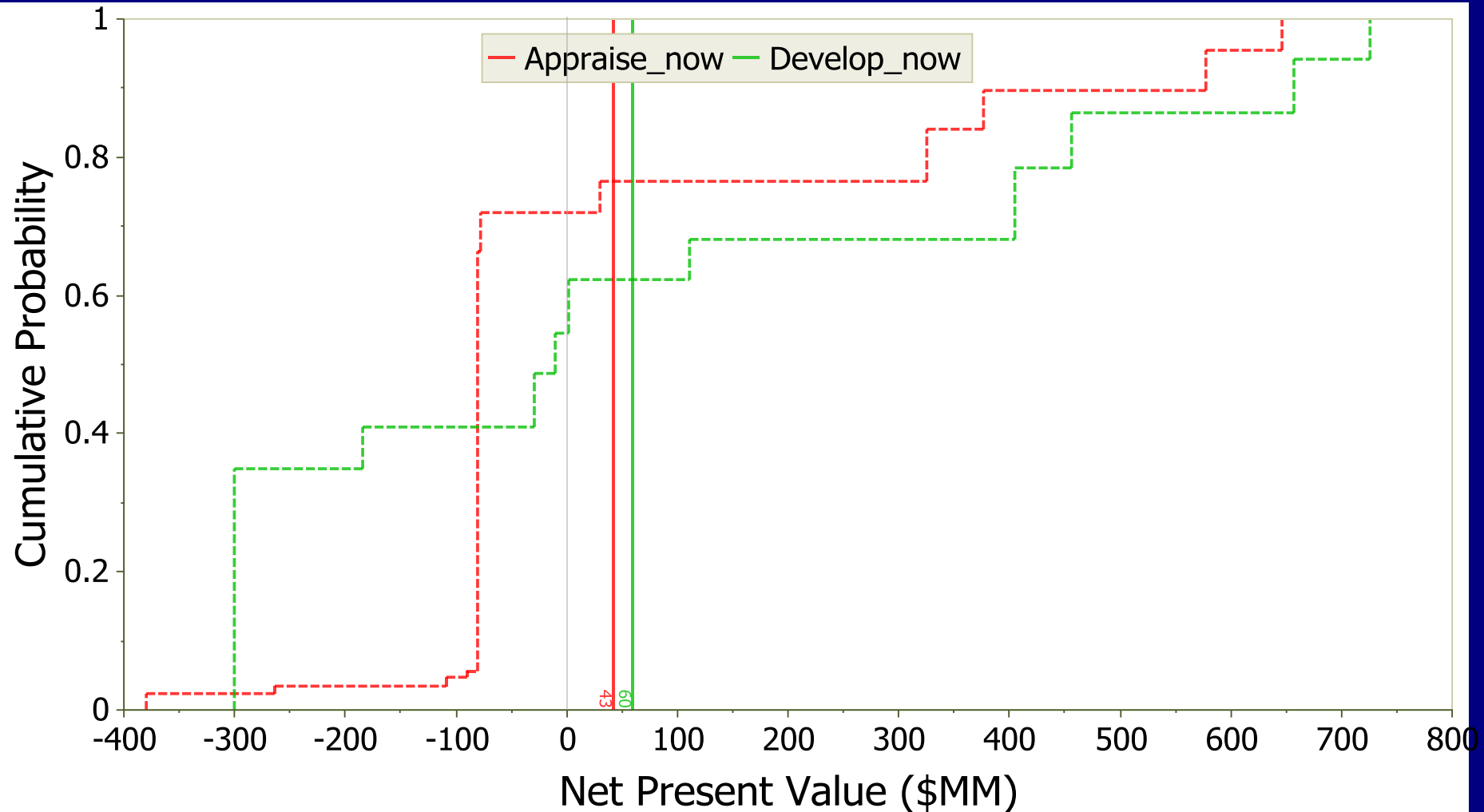


With perfect information only develop when net gain ²⁹

NPV risk profile: appraise, imperfect information

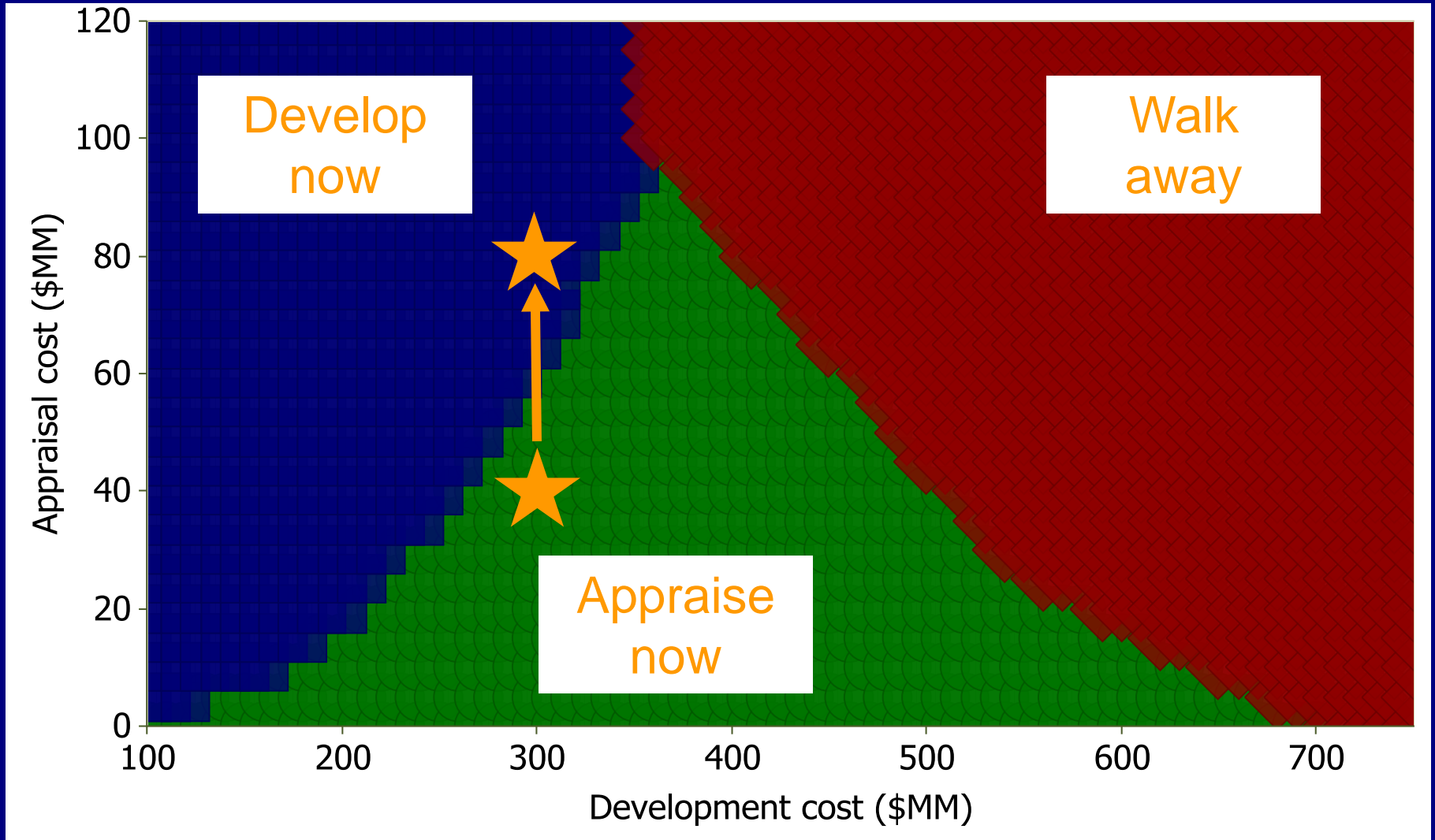


Risk appetite: which choice would you make if appraisal cost \$80MM?



What NPV would you sacrifice to avoid downside?

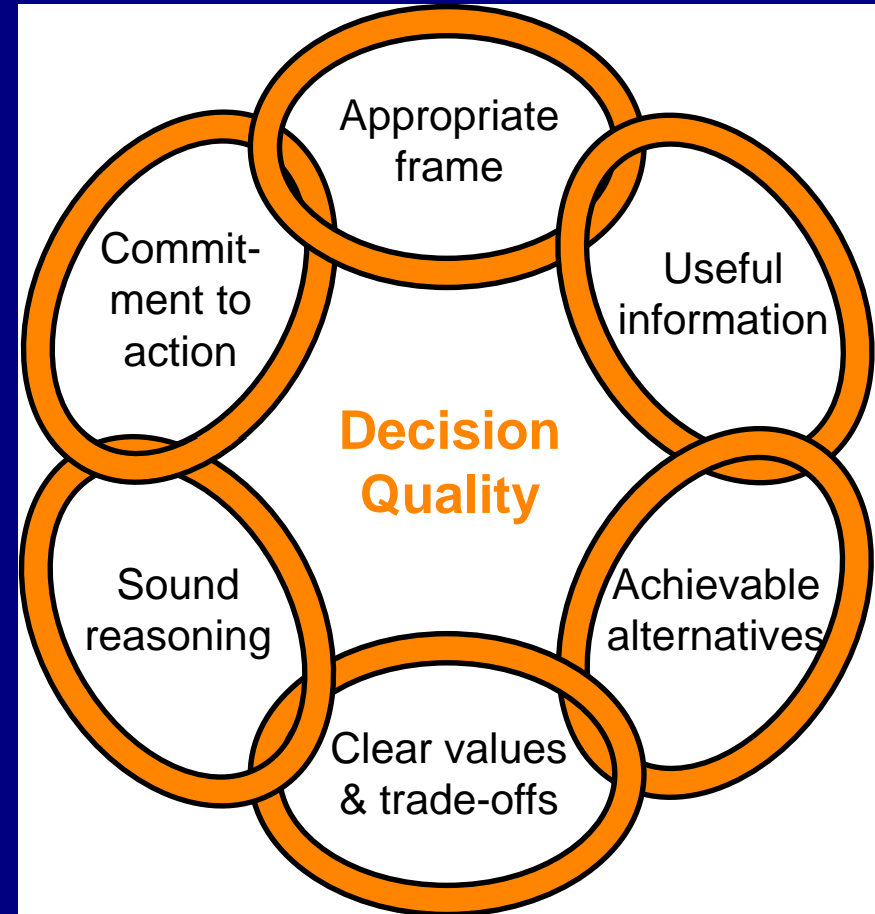
Two-way rainbow diagram



Green is where appraisal gives highest expected NPV

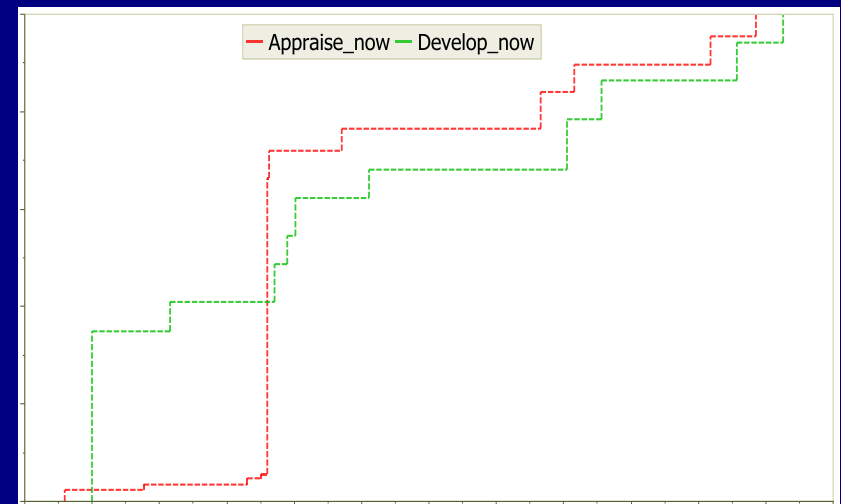
Summary: Decision Risk Analysis

- DRA can help you **optimise** not just satisfy
- Select an appropriate decision making approach
- Focus on delivering decision quality



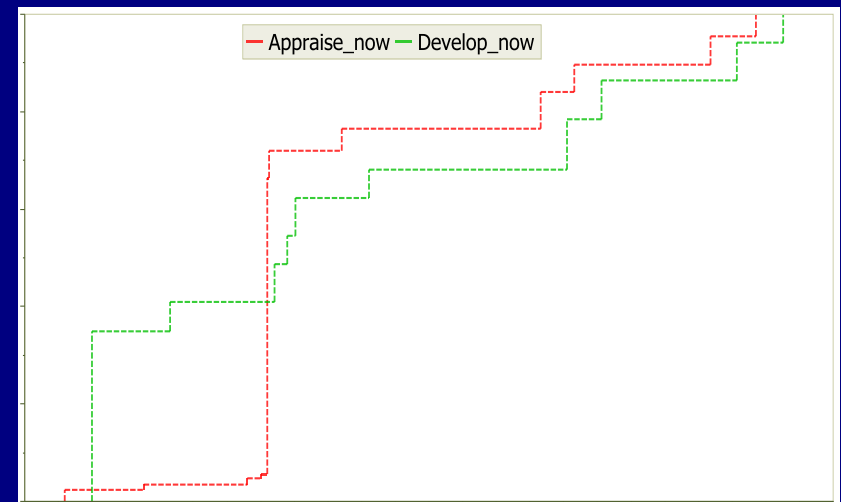
Summary: Value of Information (1)

- When?
 - Facing a number of decision options
 - Outcomes are uncertain
 - Opportunity to acquire additional information
 - Information costs money or time



Summary: Value of Information (2)

- Why?
 - Additional information might reduce future uncertainties
 - Best decision option might change with new information
- How?
 - Invest two hours and get a Decision Analyst to show you how



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