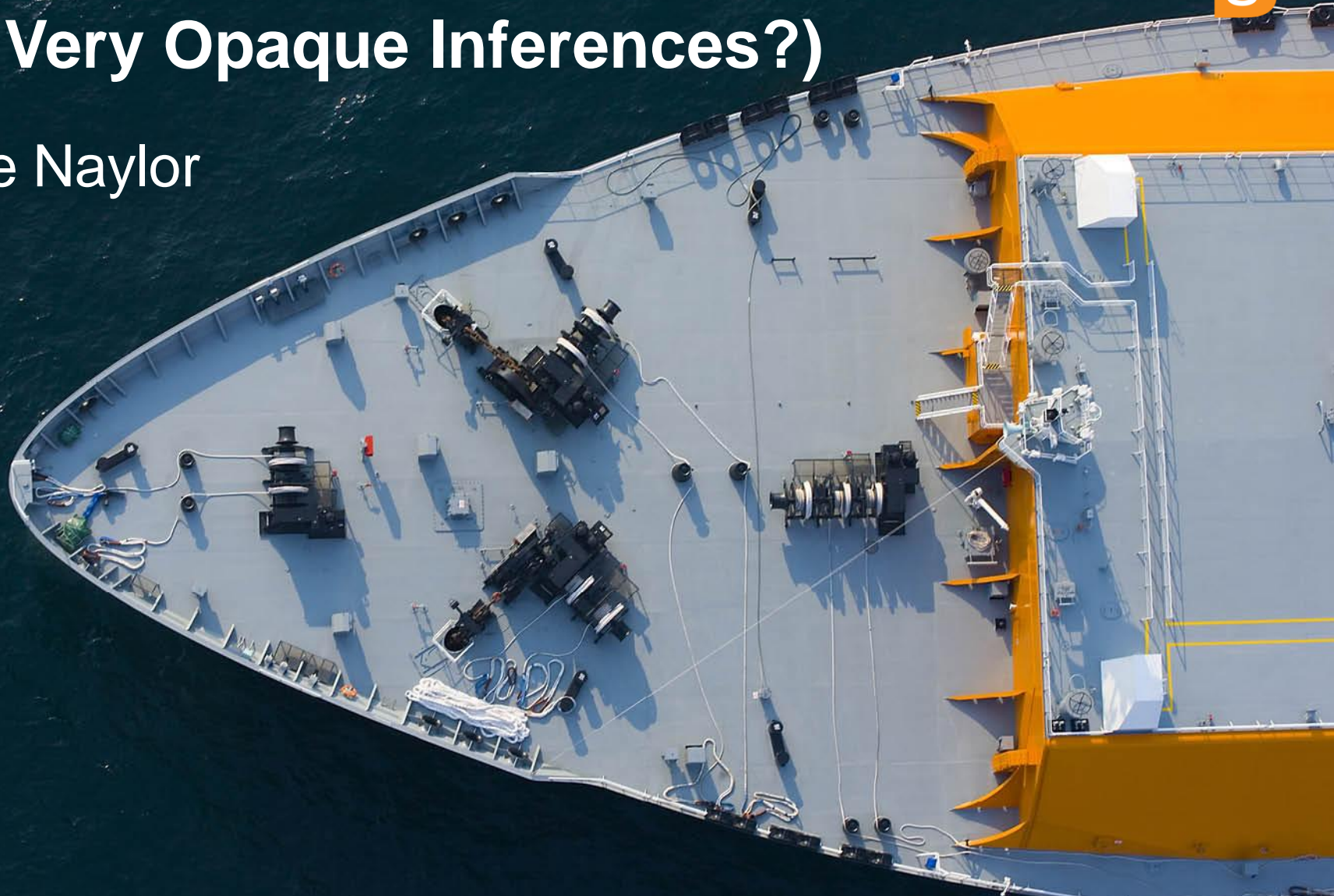


VOI: Value of Information (or Very Opaque Inferences?)

Pete Naylor



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Aims of this presentation

To provide an understanding of 'value of information' (VOI) analysis

- When?
- Why?
- How?

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To provide an understanding of 'value of information' (VOI) analysis

- When?
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When **might VOI analysis be valuable?**

- Facing a number of decisions
- Outcomes are uncertain
- Opportunity to acquire additional information
- Information costs money or time

Is the additional information worth the cost?

Why might VOI analysis be valuable?

- The additional information might reduce future uncertainties
- Decisions might change in the light of the new information

If the VOI analysis indicates that no decision changes, then do not waste the money & time in acquiring the new information

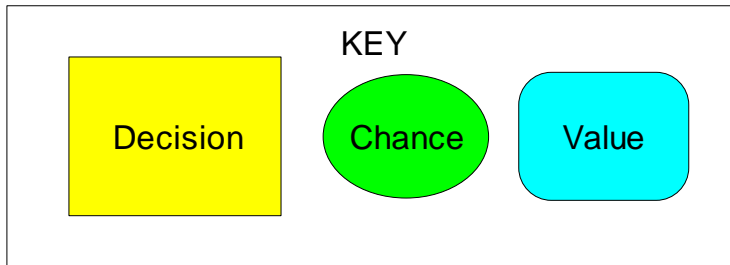
Key questions

- 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) to be measured?
 - What difference will the information make?

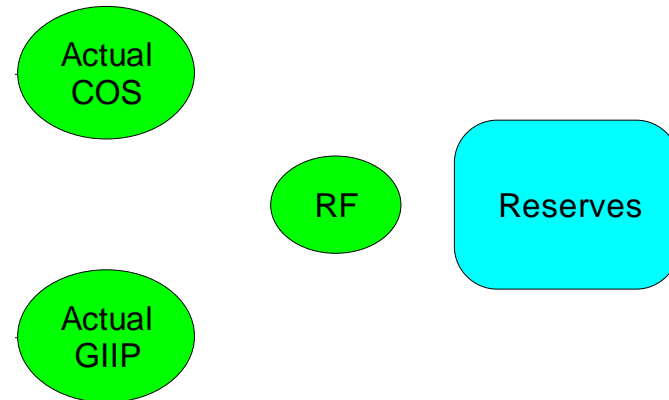
How do I undertake a VOI analysis?

- 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

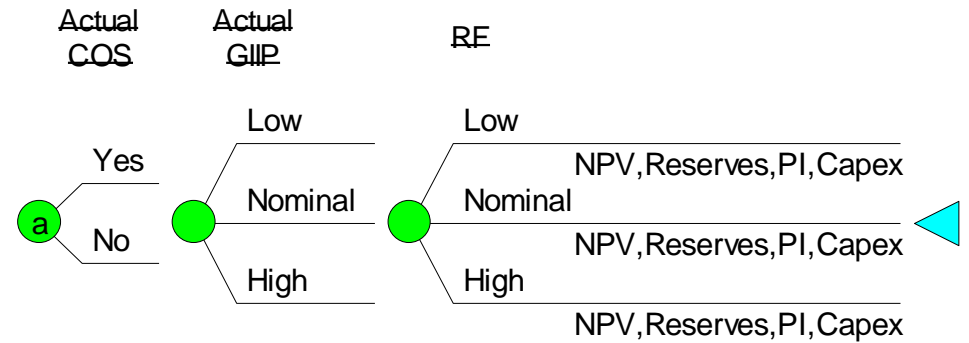
Influence diagram



$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$

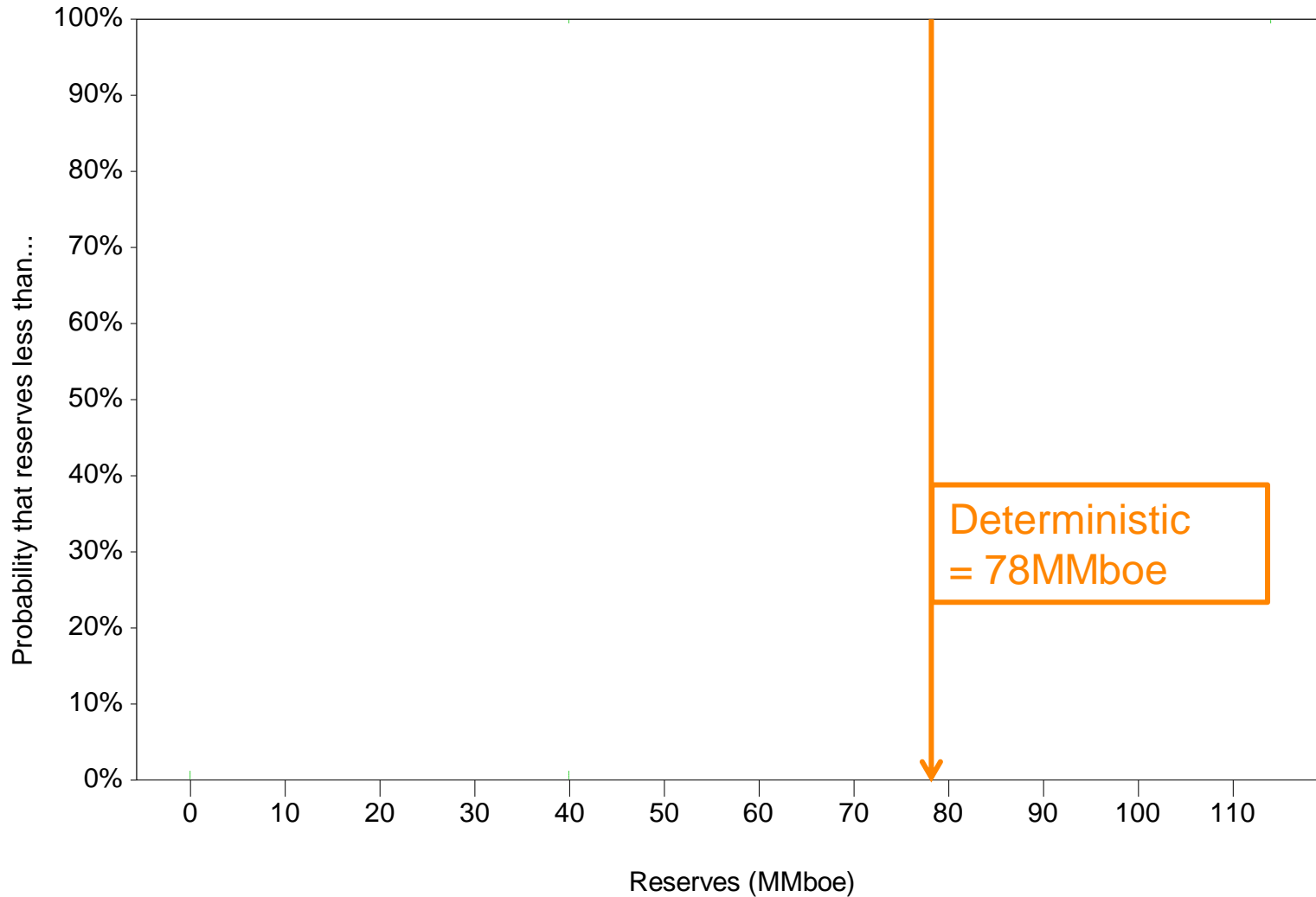


Decision tree



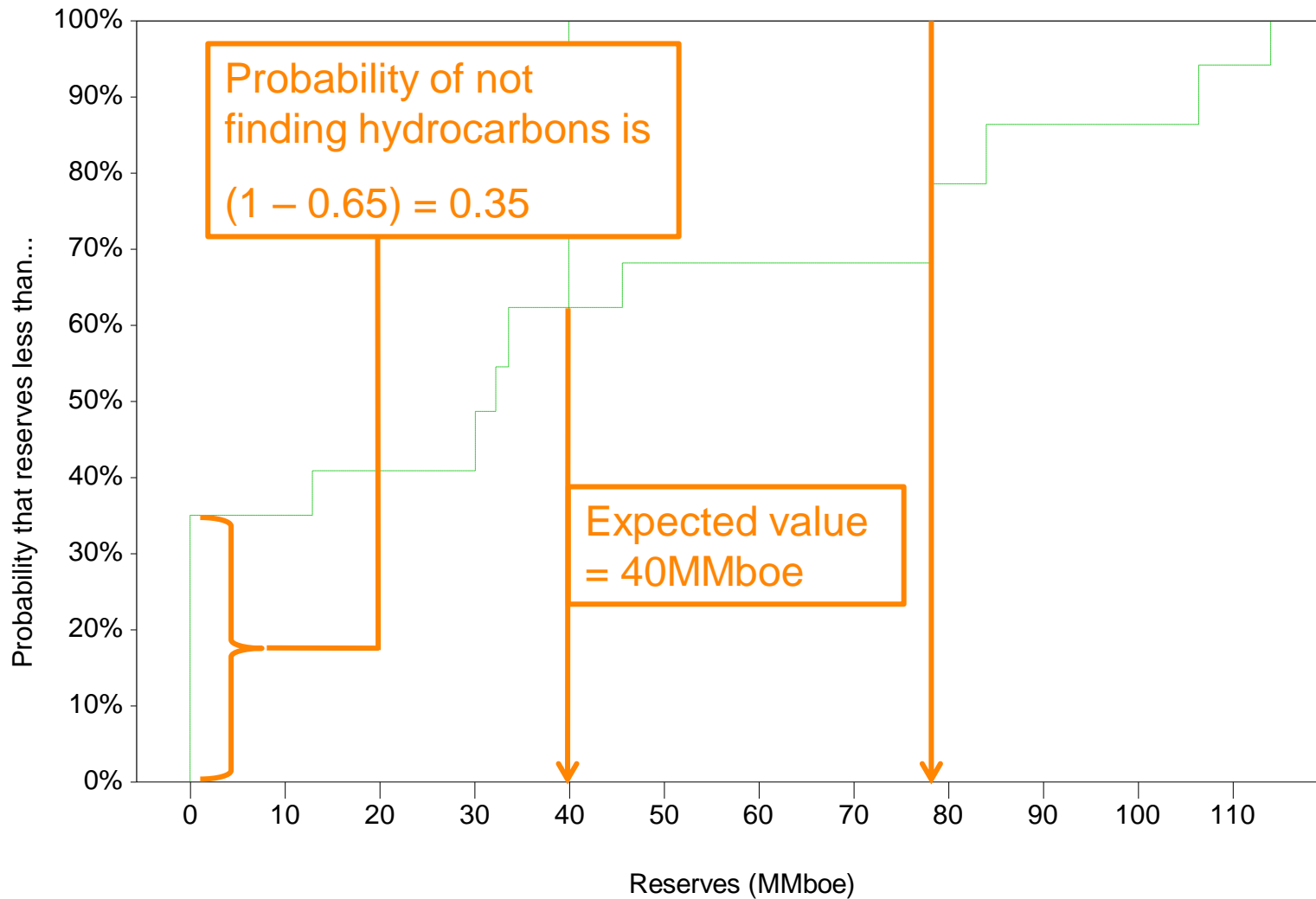
Abbreviated form of decision tree, full tree contains $2 \times 3 \times 3 = 18$ branches

Base case: reserves for North Extension



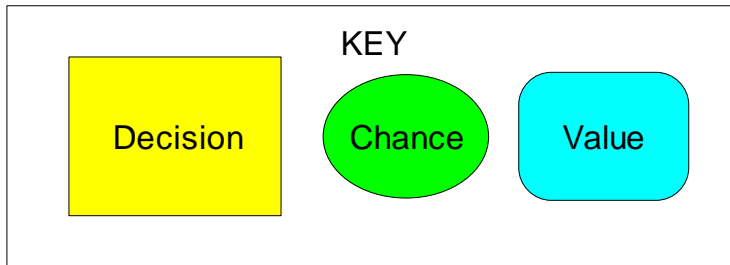
Beware that this is not the basis of your business case

Risk profile: reserves for North Extension

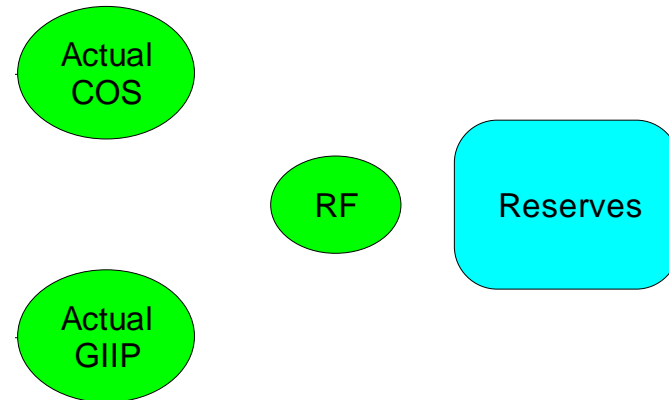


Illustrates our best estimate of the range of possible reserves

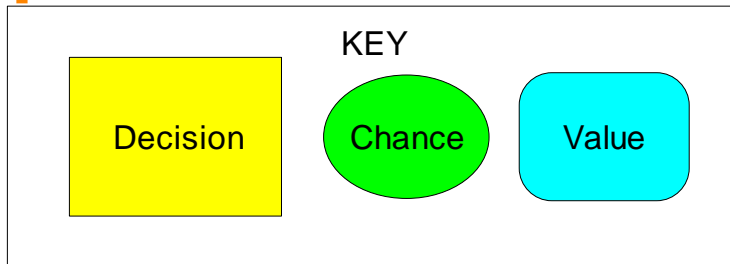
Influence diagram



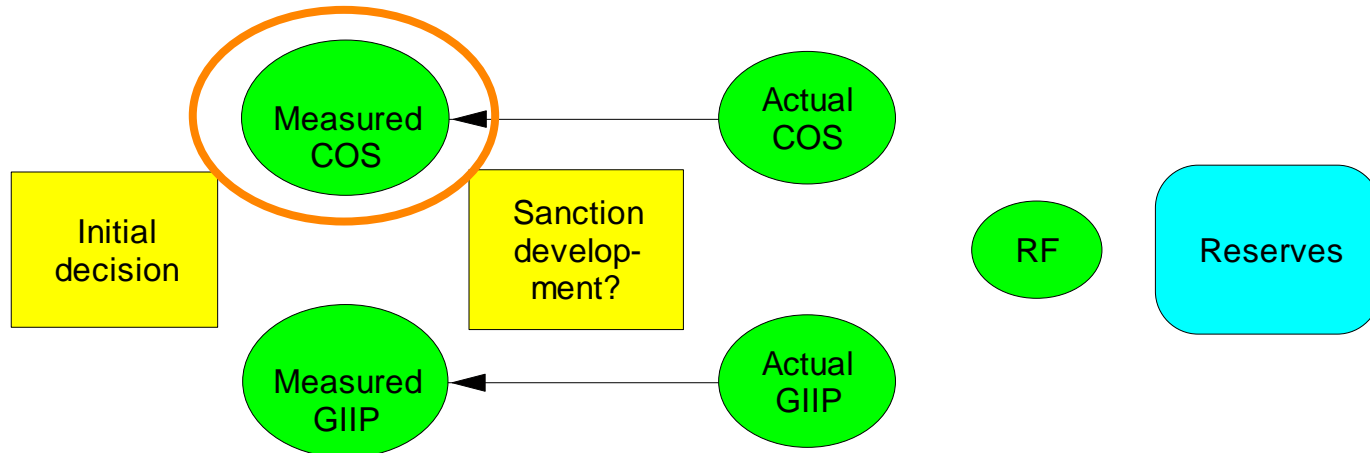
$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$



Influence diagram: extended to include appraisal

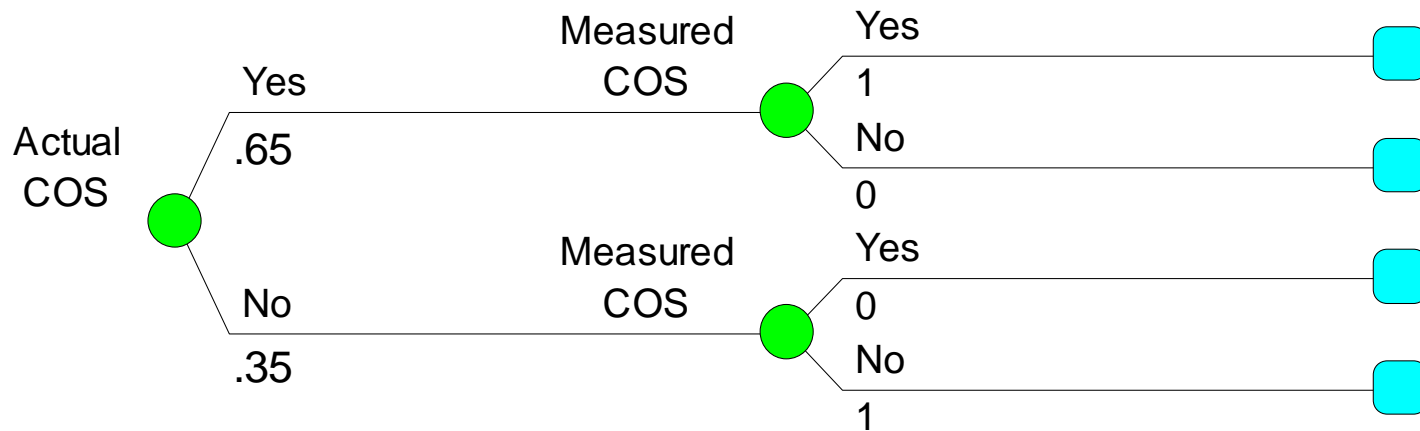


$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$



The measured information depends on the actual state of nature

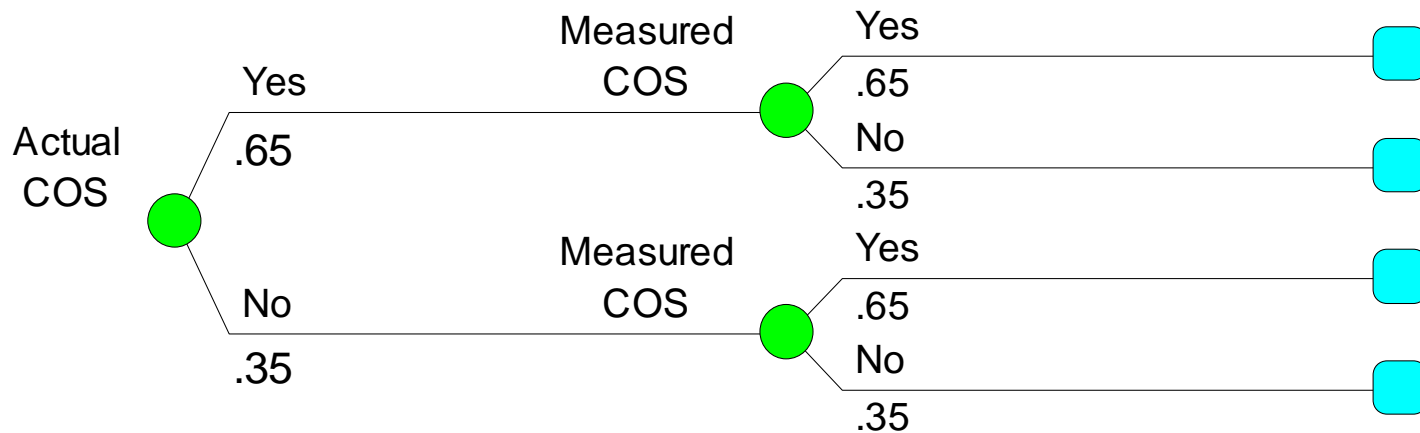
Conditional probabilities: chance of success perfect information



Captures the reliability of the measurement

Conditional probabilities: chance of success

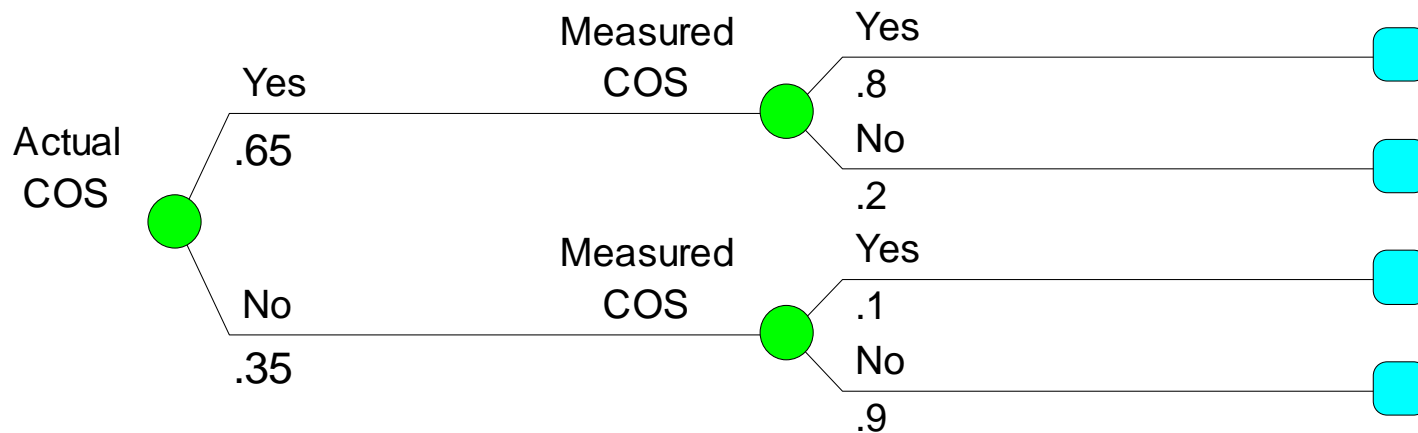
no information



Captures the reliability of the measurement

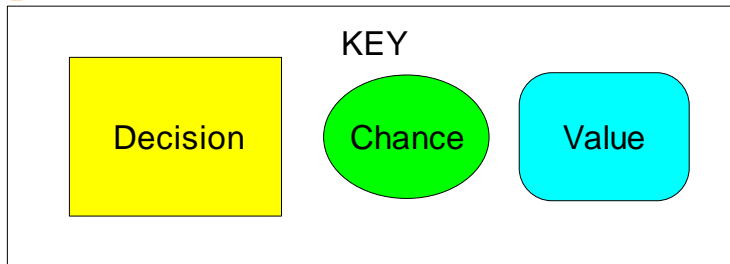
Conditional probabilities: chance of success

imperfect information

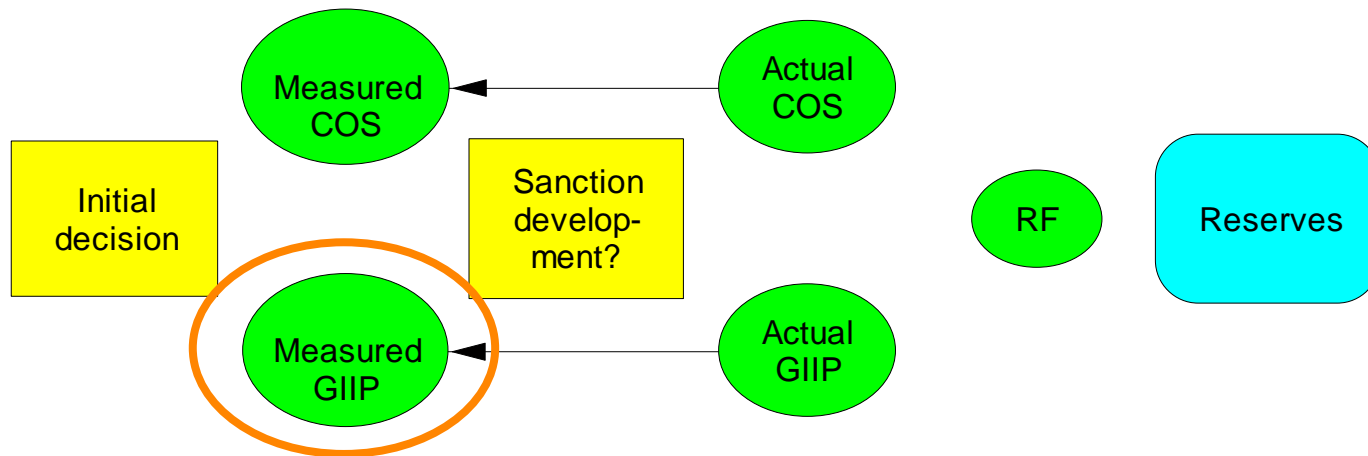


Captures the reliability of the measurement

Influence diagram: extended to include appraisal

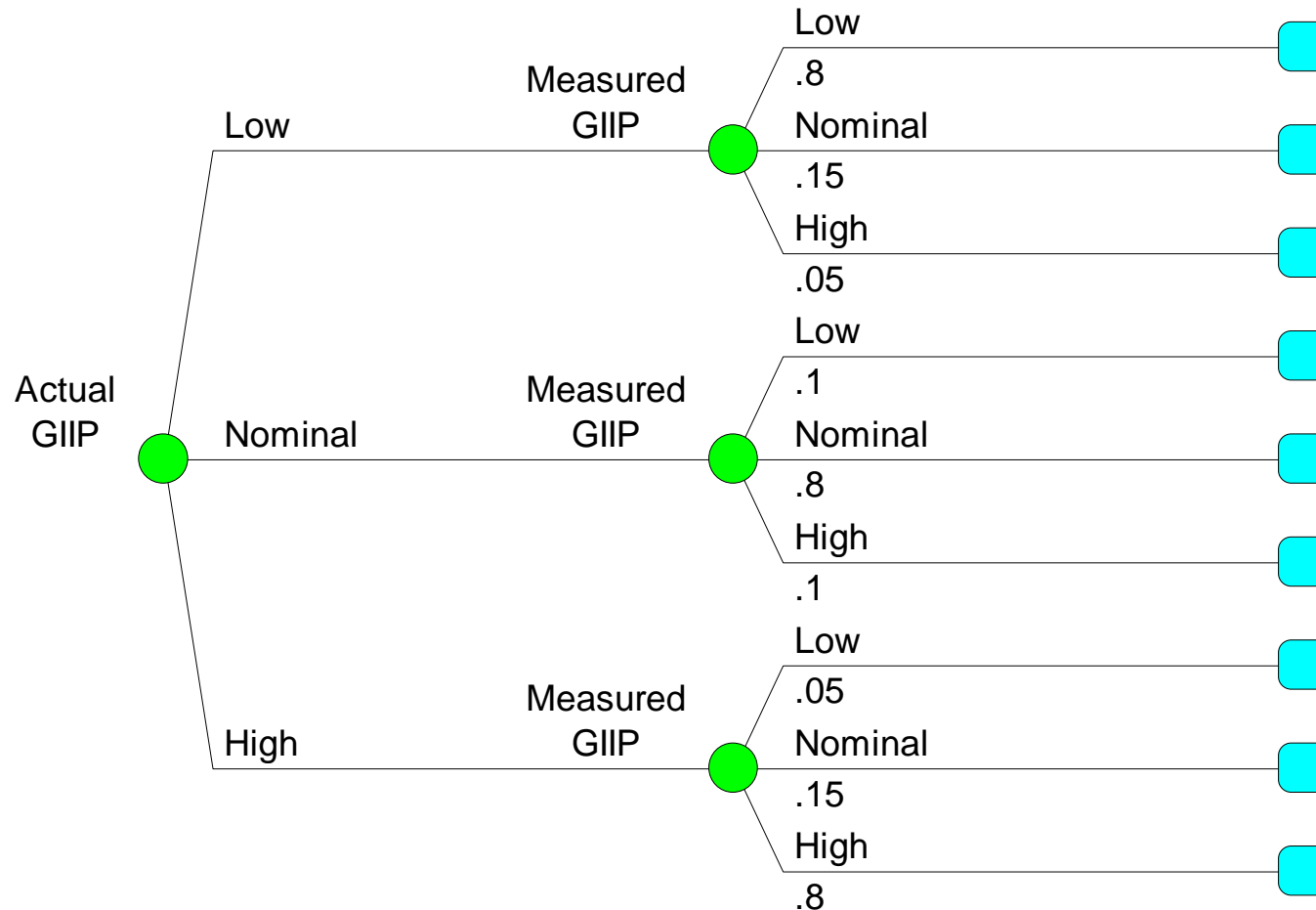


$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$



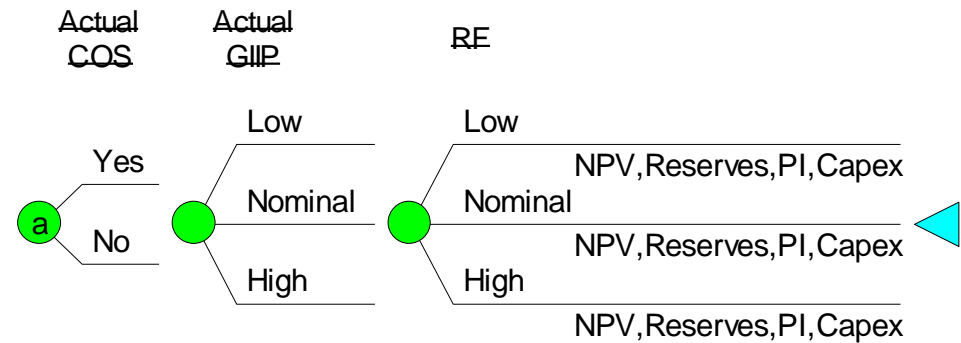
The measured information depends on the actual state of nature

Conditional probabilities: gas initially in place



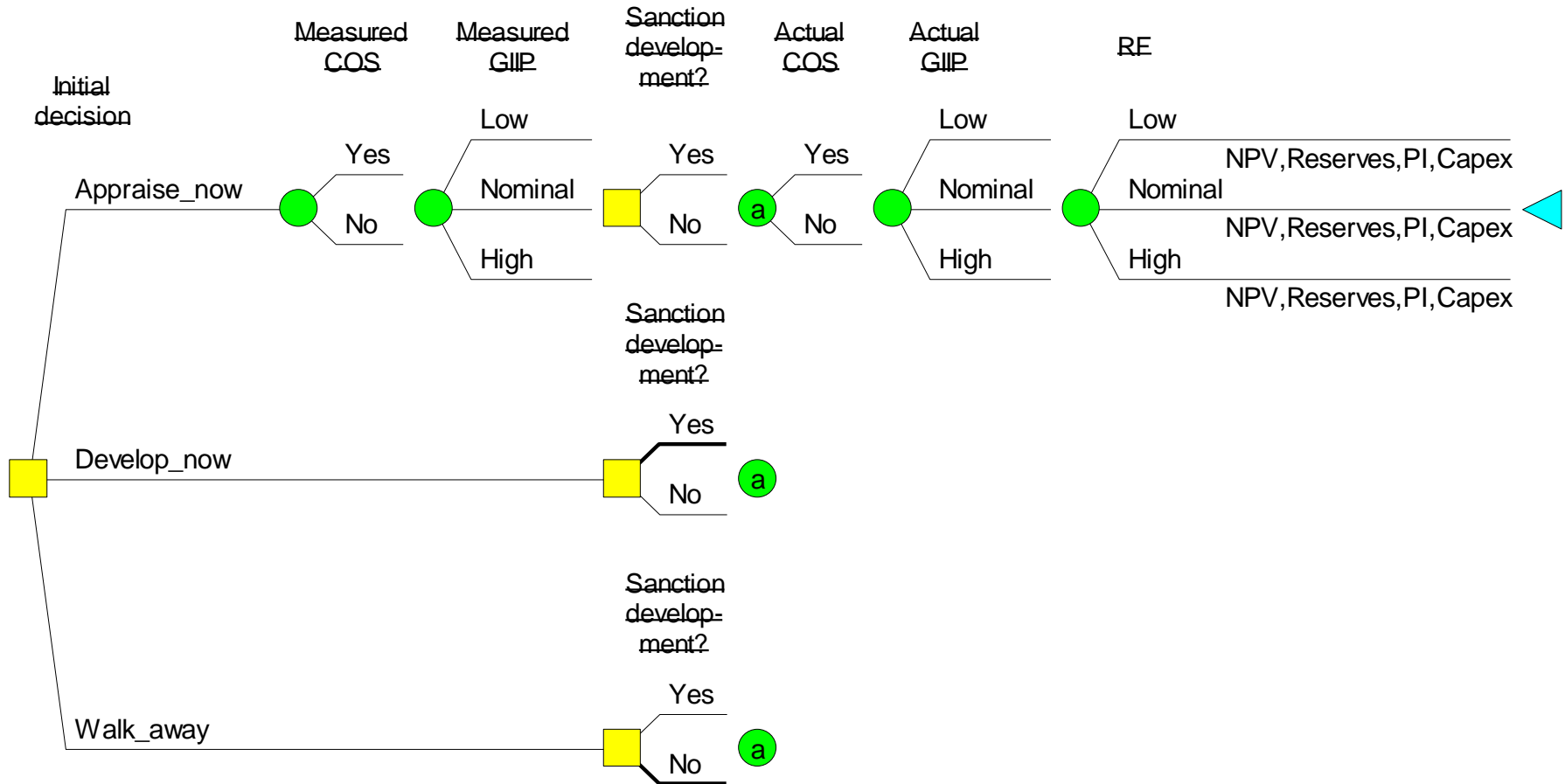
Captures the reliability of the measurement

Decision tree



Abbreviated form of decision tree, full tree contains $2 \times 3 \times 3 = 18$ branches

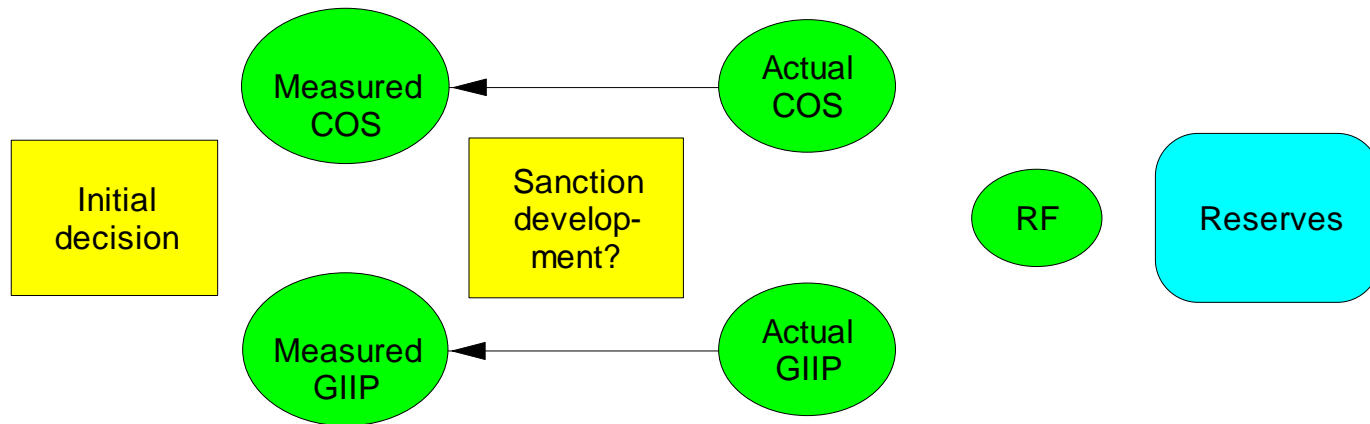
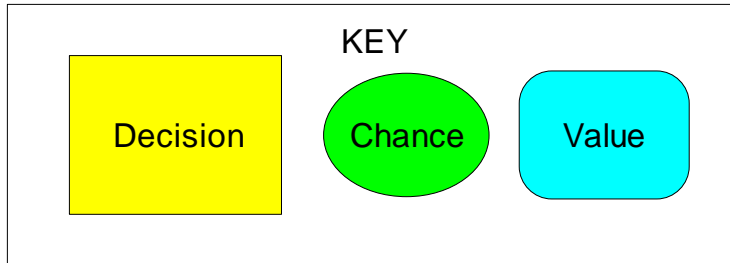
Decision tree: extended to include appraisal



Captures the time order of events

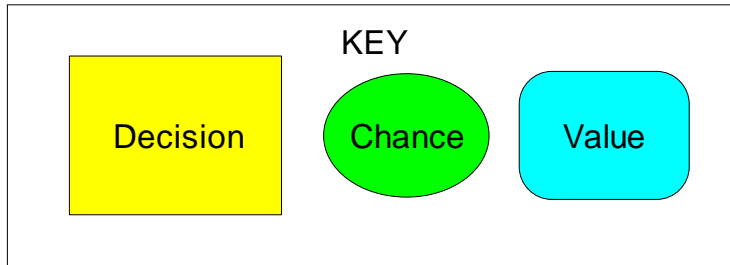
Influence diagram

$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$



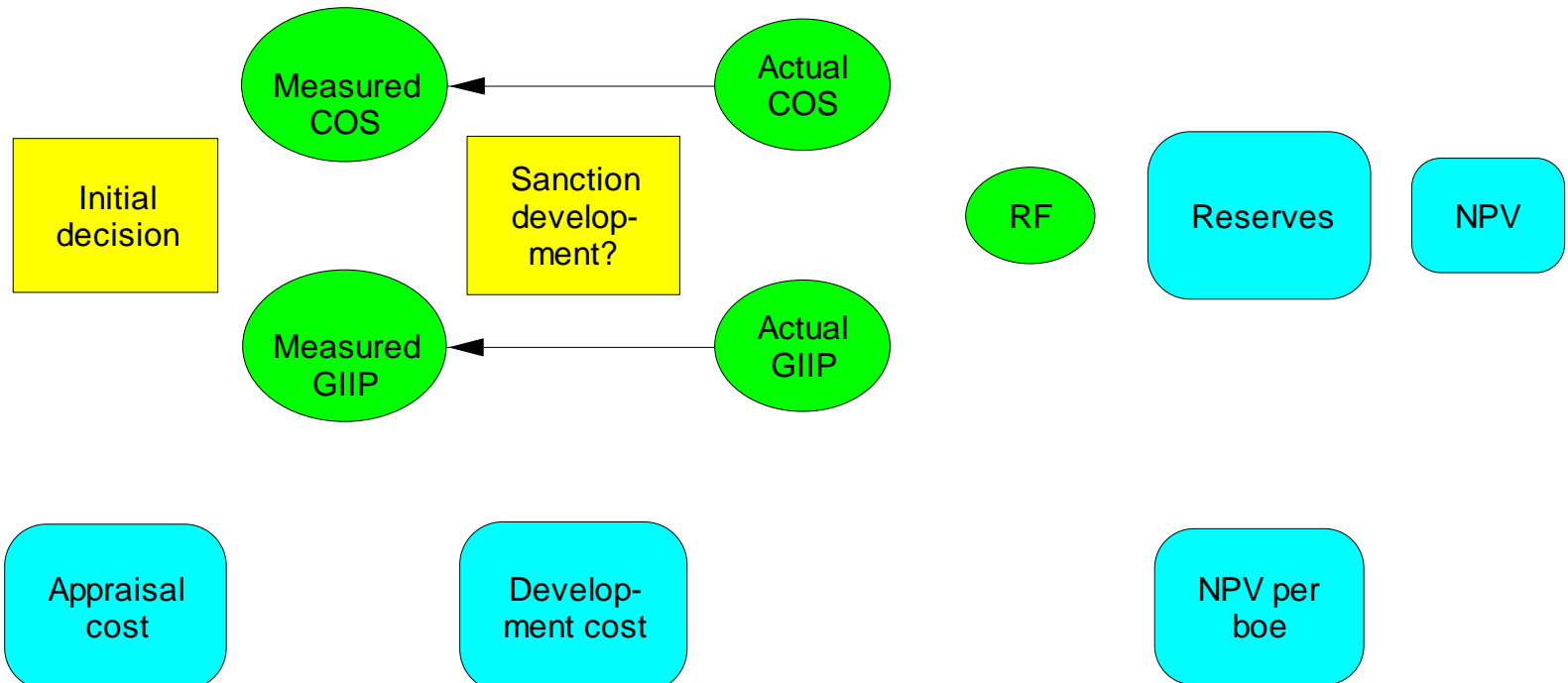
The measured information depends on the actual state of nature

Influence diagram: extended to include economics



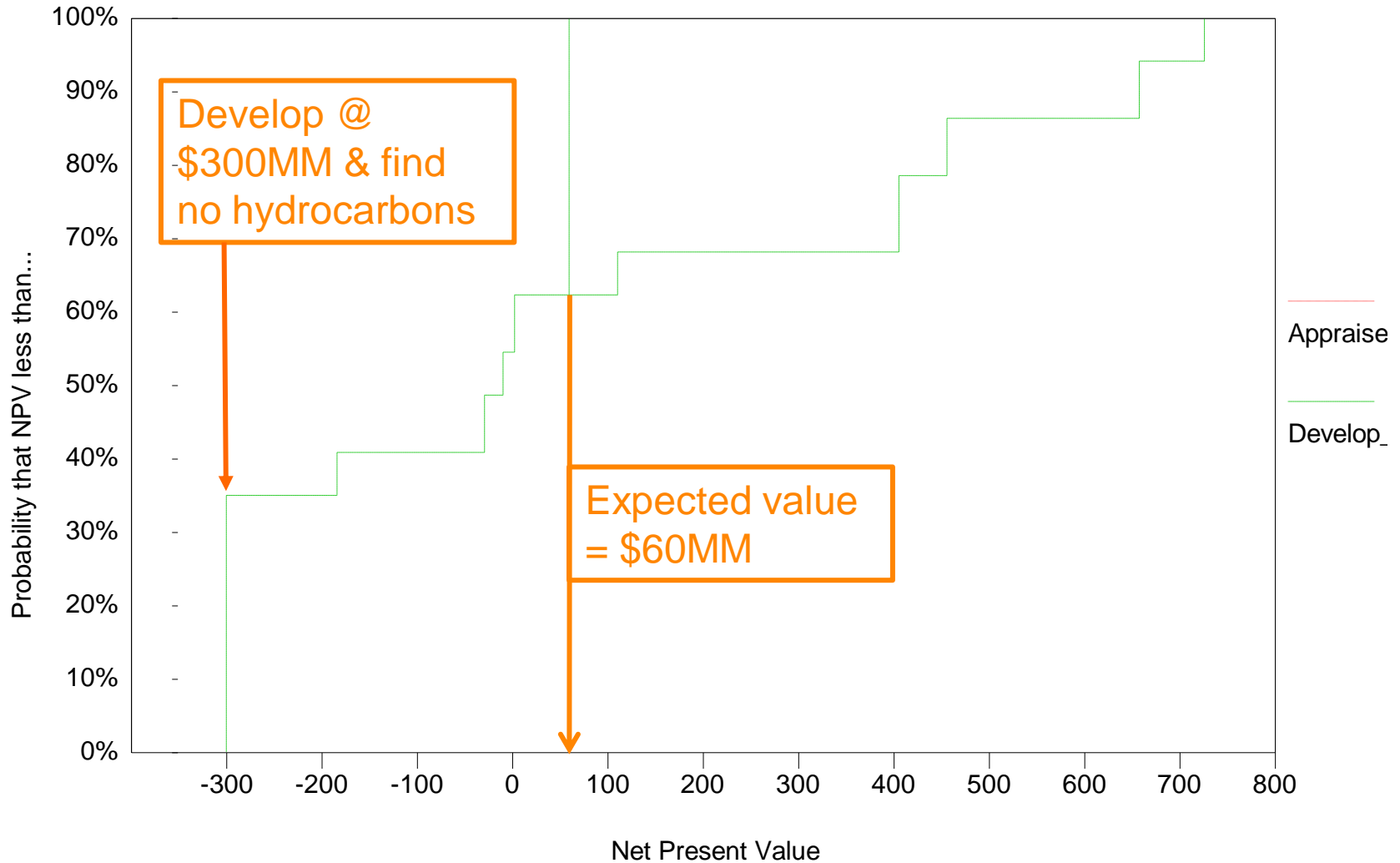
$$\text{Reserves} = \text{COS} * \text{GIIP} * \text{RF}$$

$$\text{NPV} = \text{Reserves} * (\text{NPV}/\text{boe}) - \text{Capex}$$



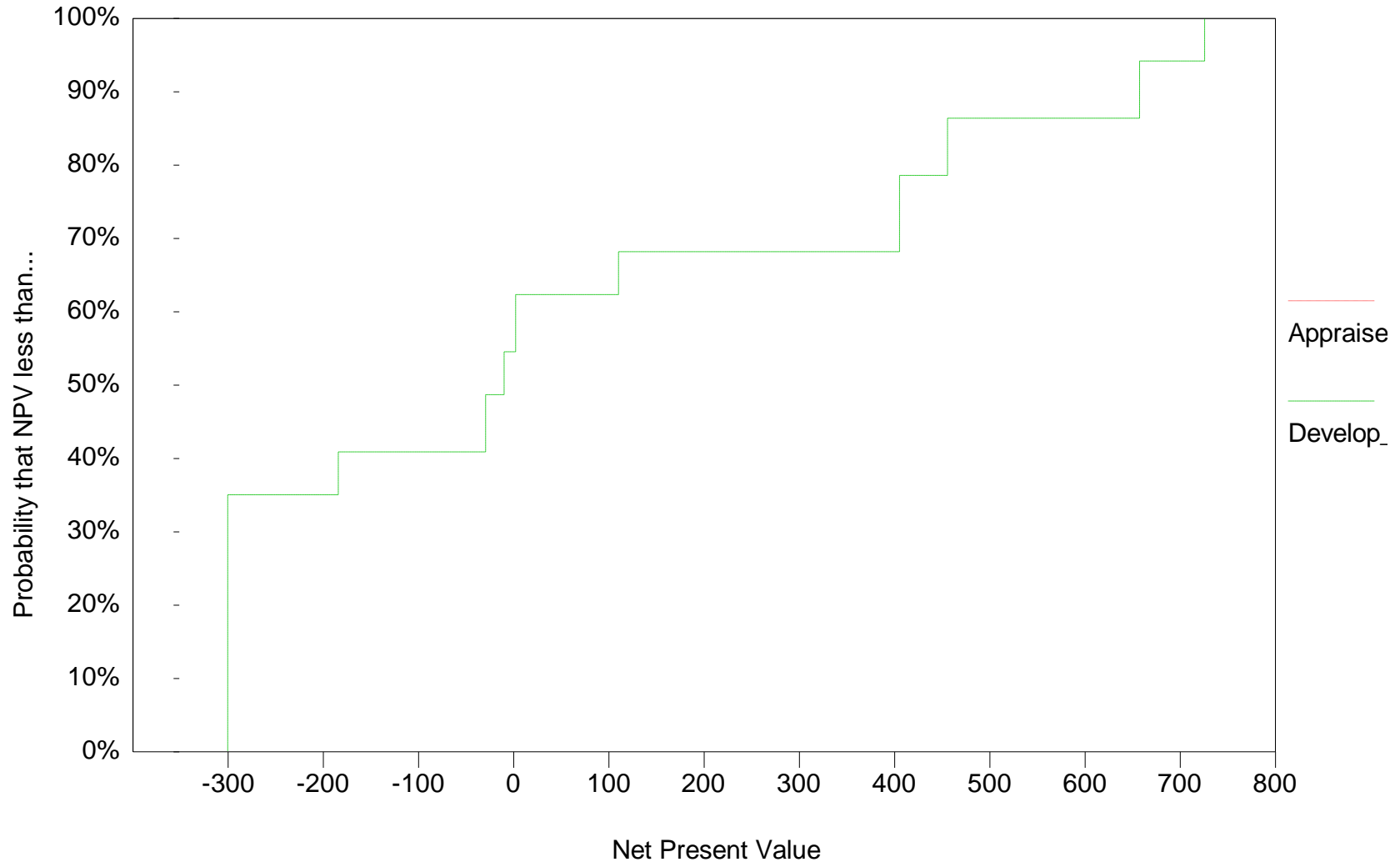
Which decision options give the best NPV?

NPV risk profile: develop now



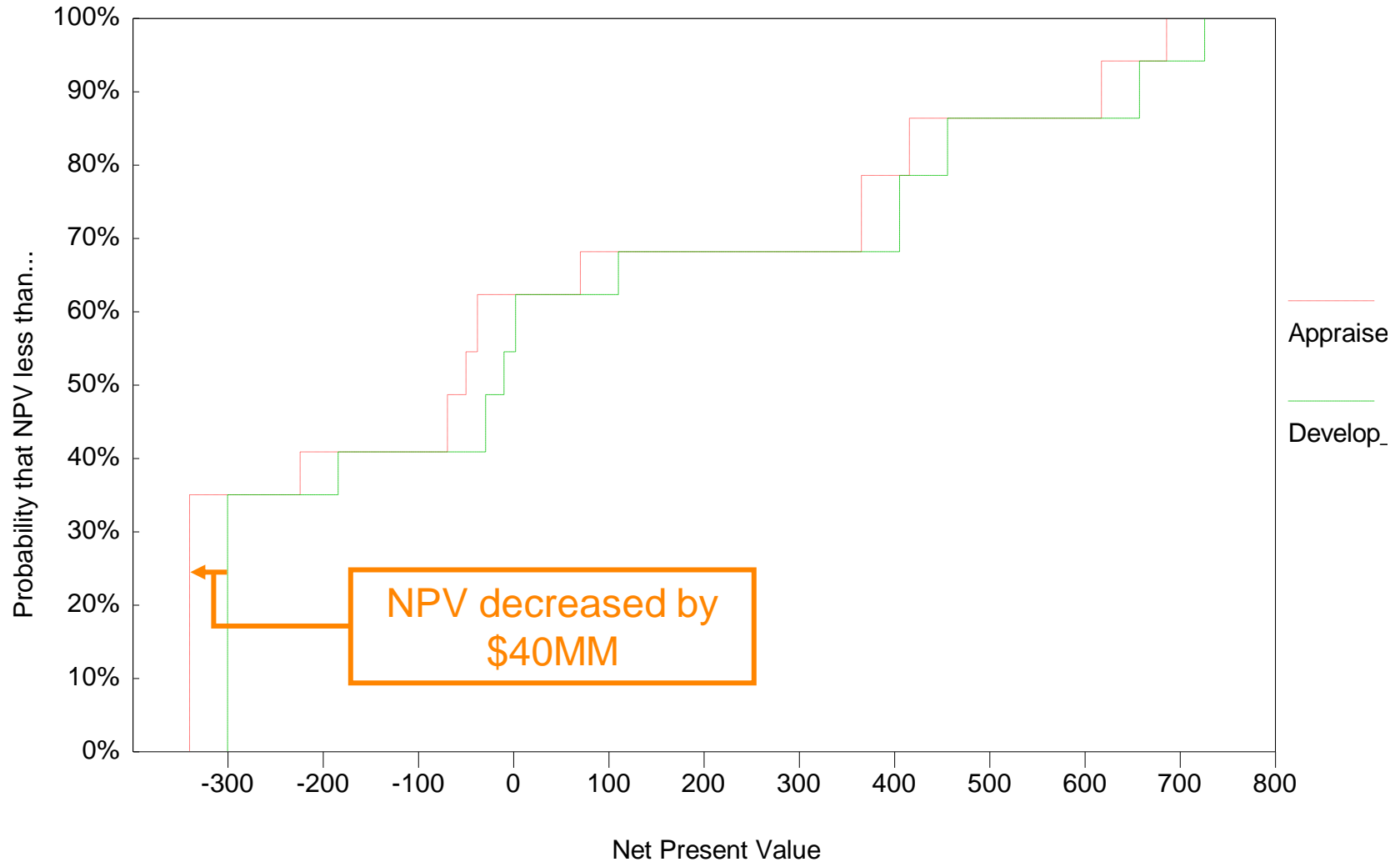
Illustrates the range of possible outcomes

NPV risk profile: develop now



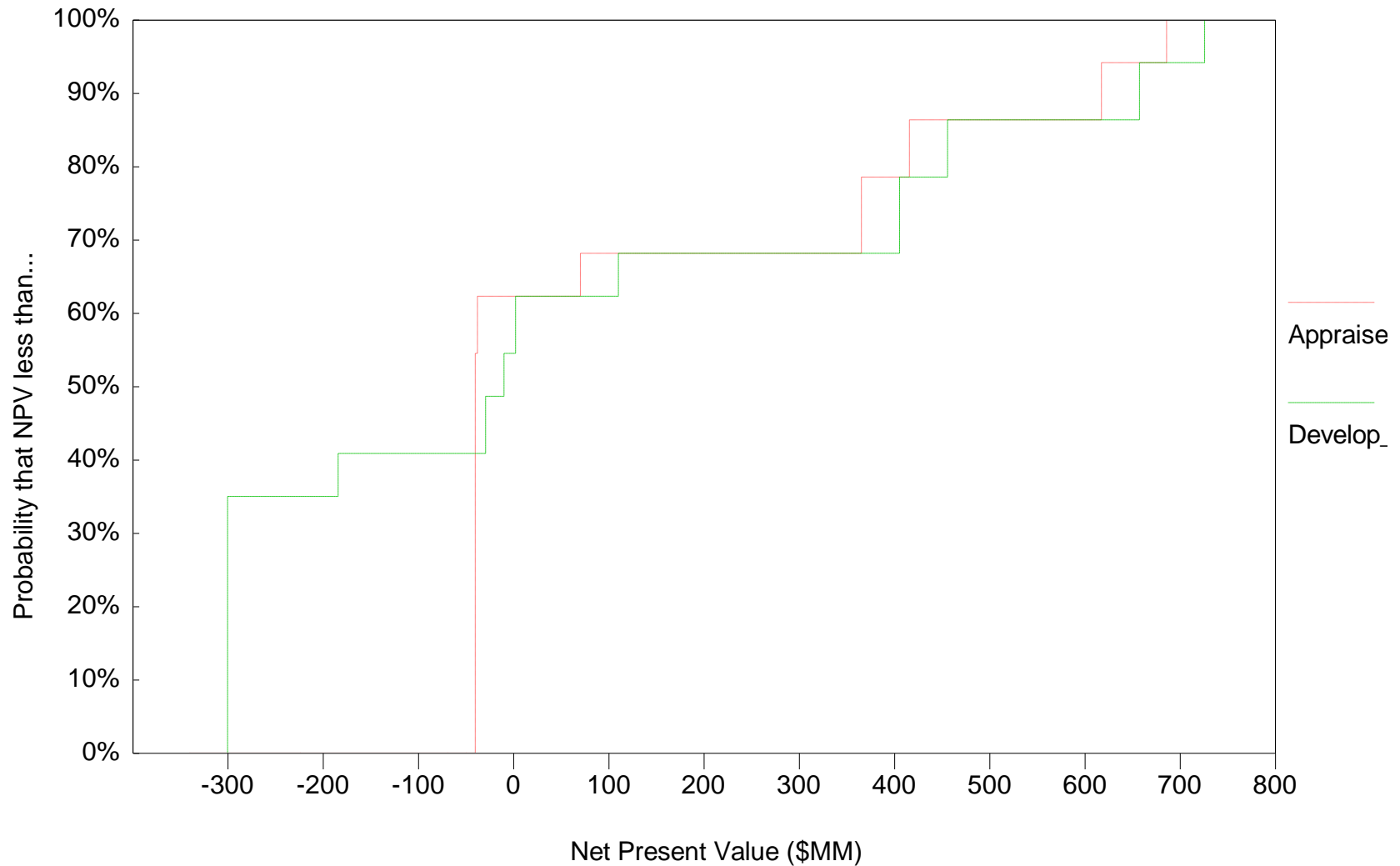
Illustrates the range of possible outcomes

NPV risk profile: appraise, no information



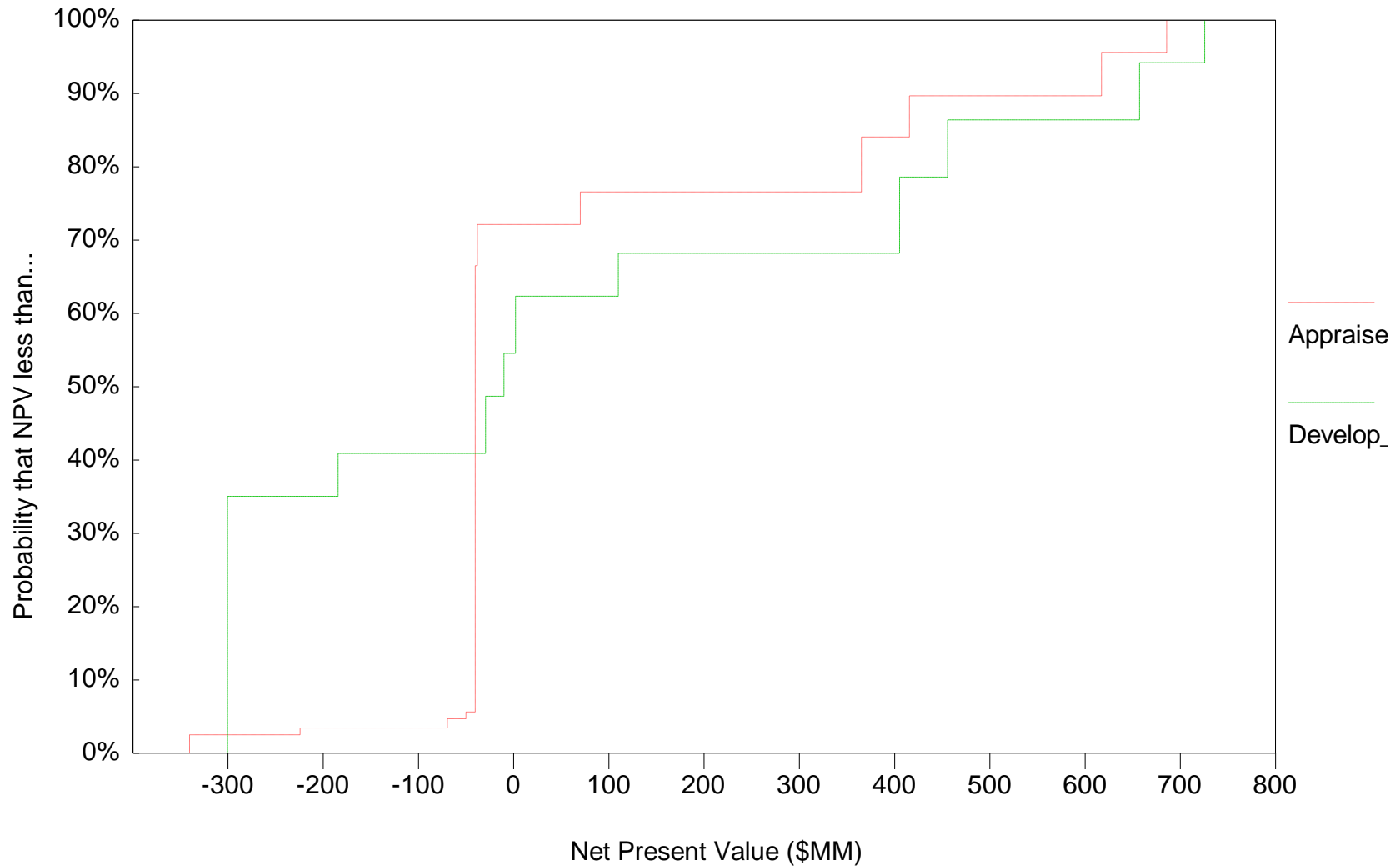
Spend the money on appraisal but get no information

NPV risk profile: appraise, perfect information



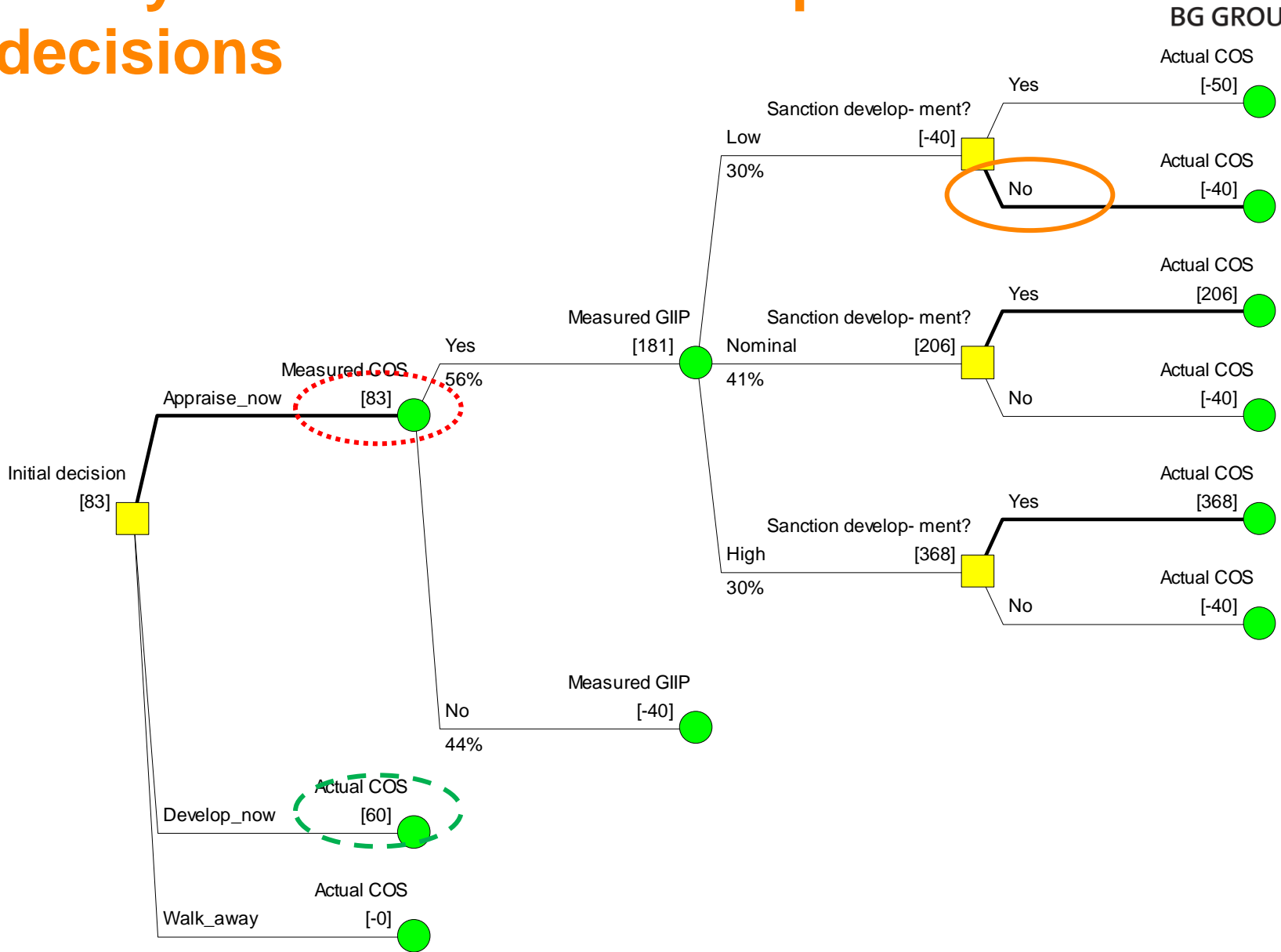
Perfect information means field is only developed when there is a net gain

NPV risk profile: appraise, imperfect information



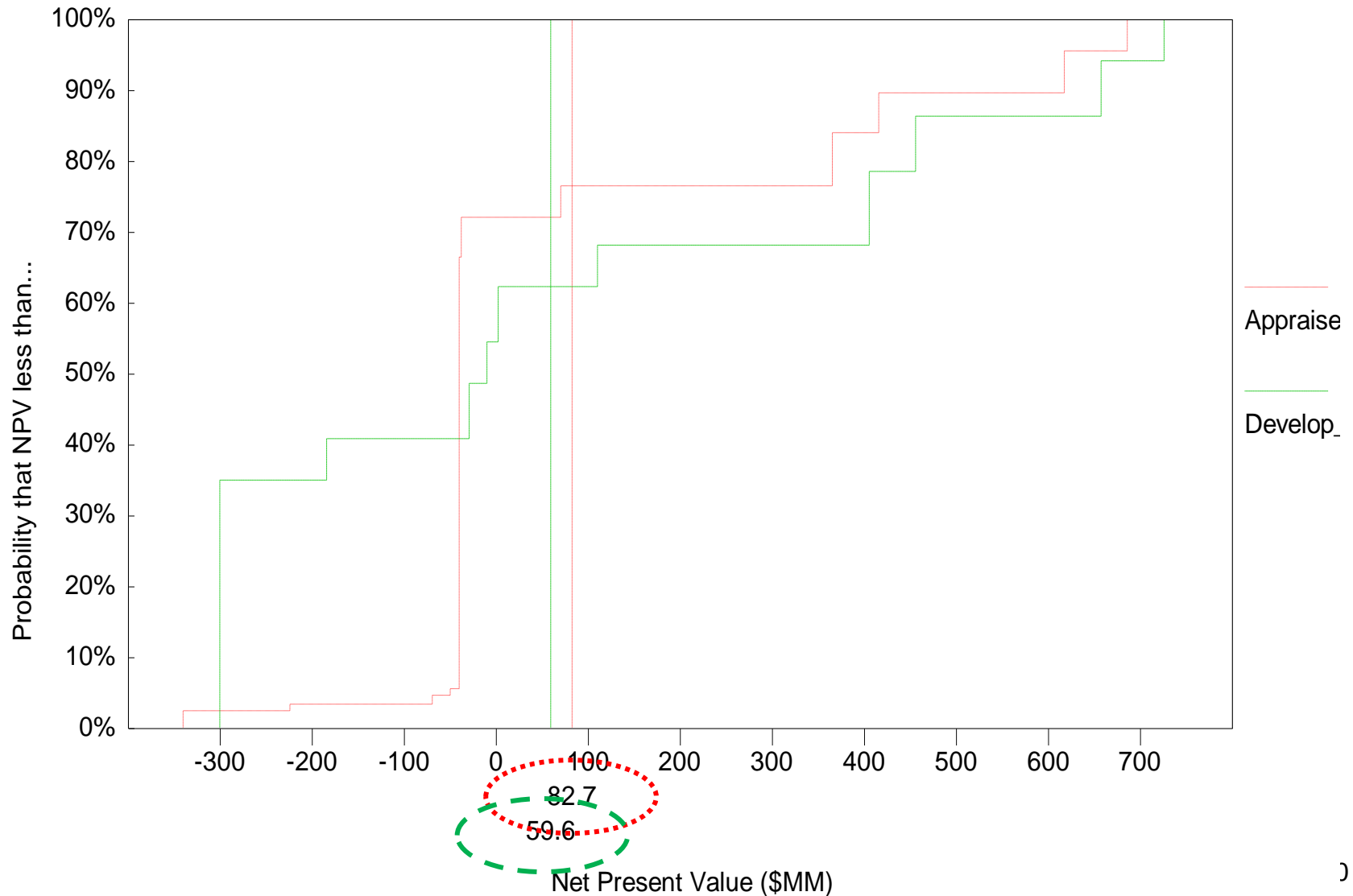
Imperfect information means that sometimes you get it wrong

Policy tree: identifies the optimum decisions

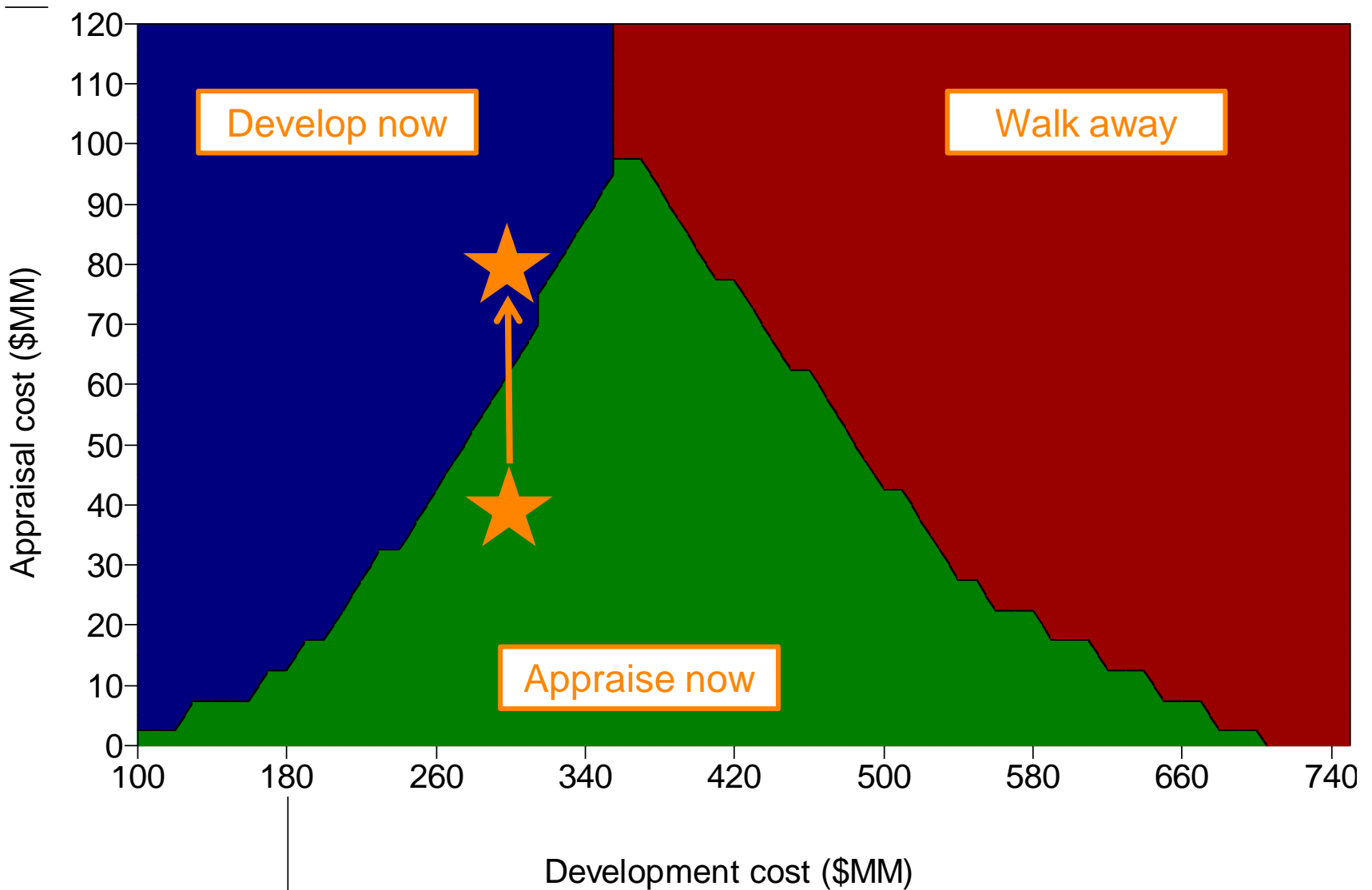


Note the appraisal information alters the development decision

NPV risk profile: appraise, imperfect information

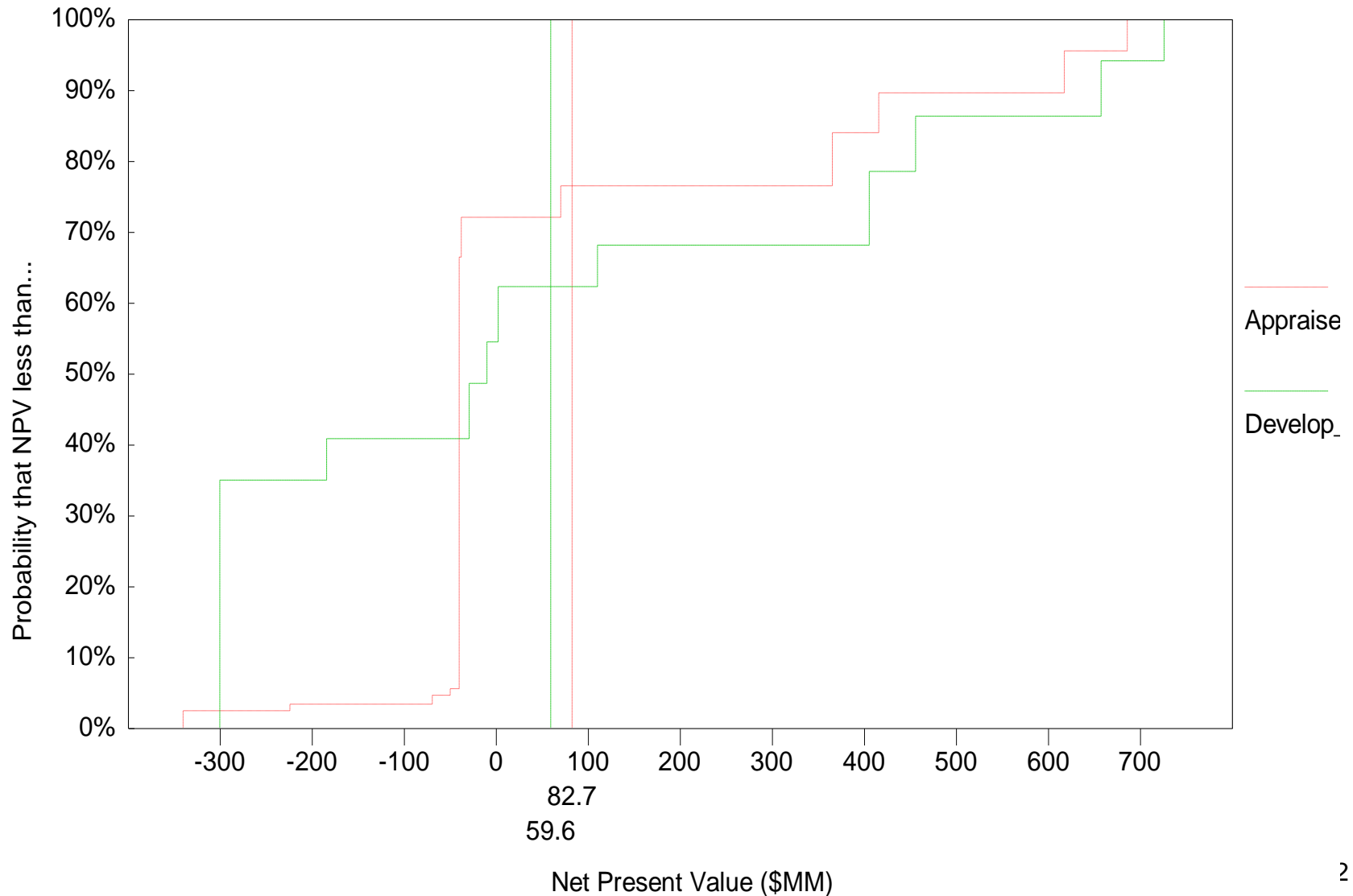


Two-way rainbow diagram

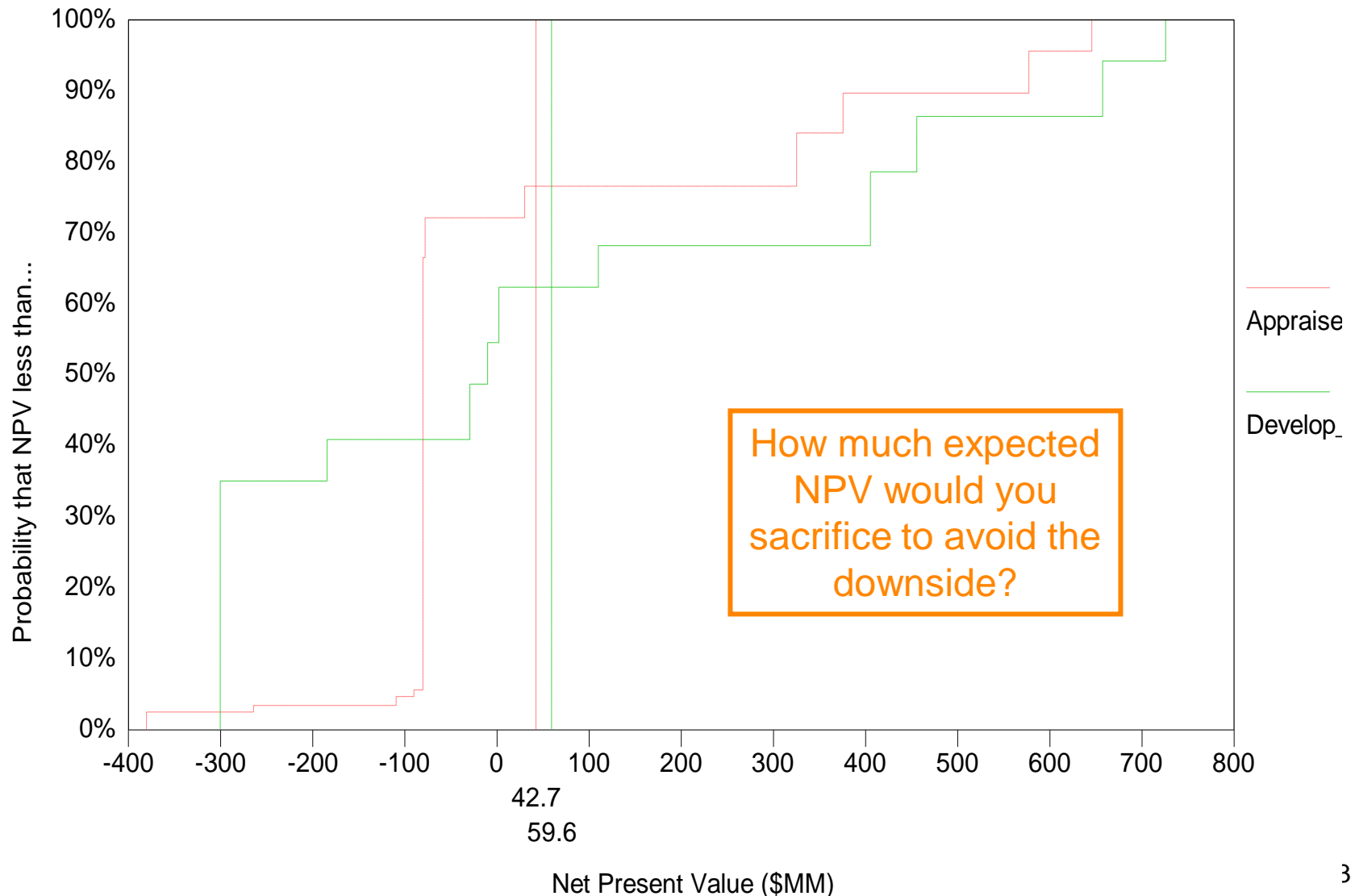


Green indicates where appraisal give highest expected NPV

NPV risk profile: appraise, imperfect information



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



Summary: Value of information

- When?
 - Facing a number of decisions
 - Outcomes are uncertain
 - Opportunity to acquire additional information
 - Information costs money or time
- Why?
 - The additional information might reduce future uncertainties
 - Decisions might change in the light of the new information
- How?
 - Invest two hours and get a Decision Analyst to show you how

“*What the hell* is always the right decision!”

Marilyn Monroe (1926-1962)



May have worked for Marilyn, but your management will require more analysis

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