



*decisions with confidence*

# Masterclass: Reserves Booking and Portfolio Management

Adam Borushek & Gavin Ward

DEVEX Aberdeen, 21 June 2023

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- This presentation has Reserves content
  - Reserves discussions are known to cause drowsiness, restlessness and in extreme cases feelings of nausea. In the event of any of these, alcohol is strongly recommended
  - Nevertheless, reserves assessment should not be undertaken while under the influence of alcohol, drugs or by anyone without an appropriate degree and at least 10 years of practical experience in petroleum engineering or petroleum production geology
  - Failure to comply may result in severe damage to share price

# Disclaimer and Declaration



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# What are reserves and why are they important?

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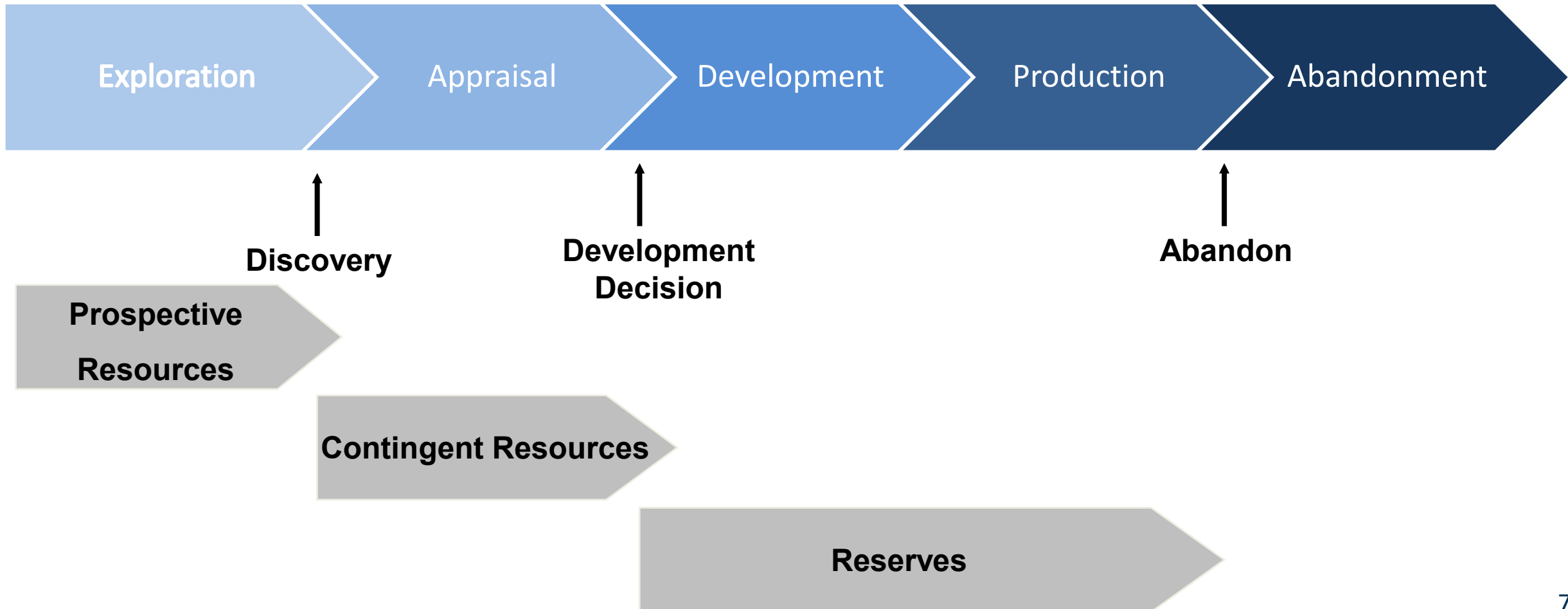
- What are Reserves?
  - A company's share of remaining commercially recoverable oil and gas to be produced and sold
  - Reserves are the main Upstream asset of an E&P company
  - They contribute to a field's value, the company's value and therefore share price
- Reserves have many purposes:
  - Corporate reporting
  - Asset valuation for acquisitions and divestments
  - Investment decisions for financing
  - Government planning

- International – PRMS\* (Petroleum Resource Management System)
- USA – SEC (Securities and Exchange Commission)
- Canada – COGE (Canadian Oil and Gas Evaluation)
- Other countries – eg Russian, Chinese standards
- UNFC (United Nations Framework Classification for Resources)
  
- The PRMS was adapted for CO<sub>2</sub> storage as the SRMS (CO<sub>2</sub> Storage Resources Management System) and the classifications changed to include “Capacity”, which is equivalent to reserves

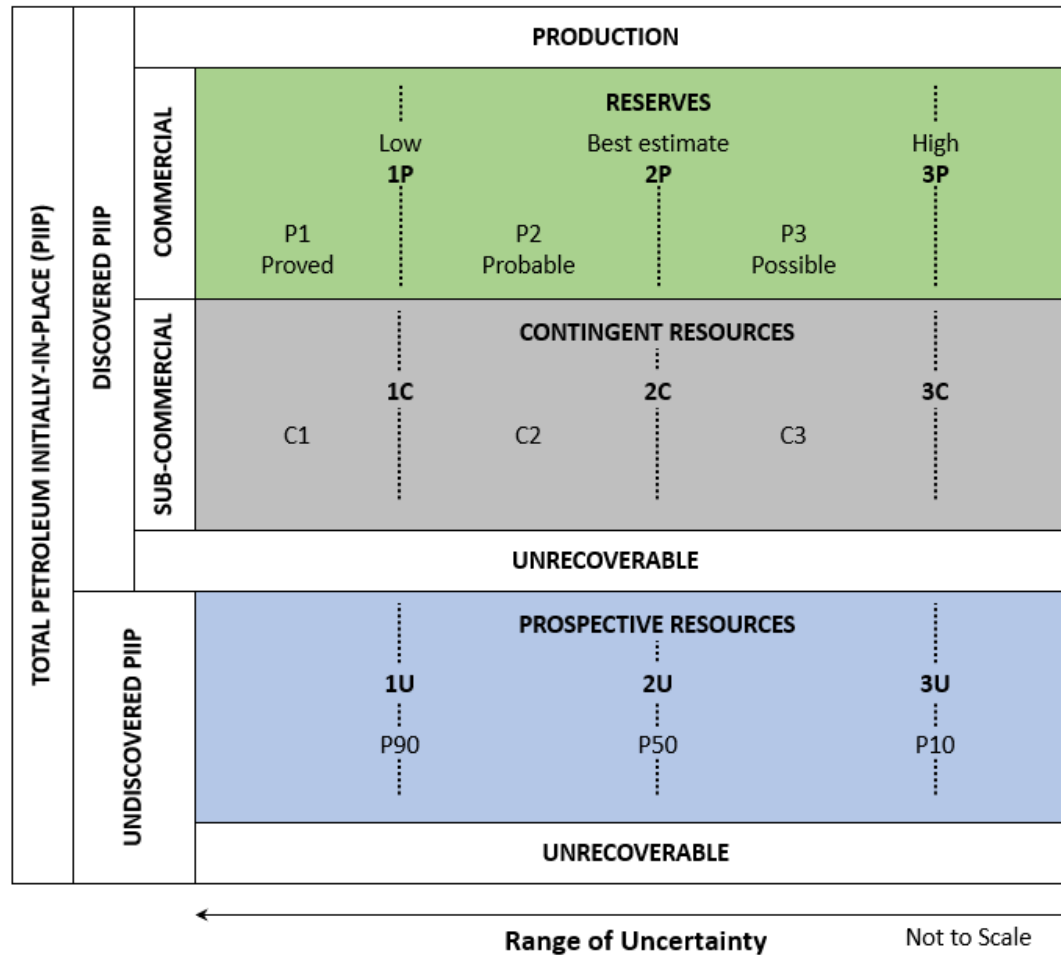
\*The PRMS is available at <https://www.spe.org/en/industry/reserves/>

- Petroleum Resources Management System (PRMS)
  - A classification system for oil and gas reserves
  - Co-sponsored by several industry bodies: SPE, WPC, AAPG, SPEE, SEG, SPWLA and EAGE
  - Uncertainty in recovery of the defined project is evaluated separately from commercialisation risks
  - Based on net sales quantities: accounts for ownership/entitlement

- The PRMS reserves classification depends on maturity and is “project-based”



# PRMS Resource Classification Framework



Increasing Chance of Commerciality

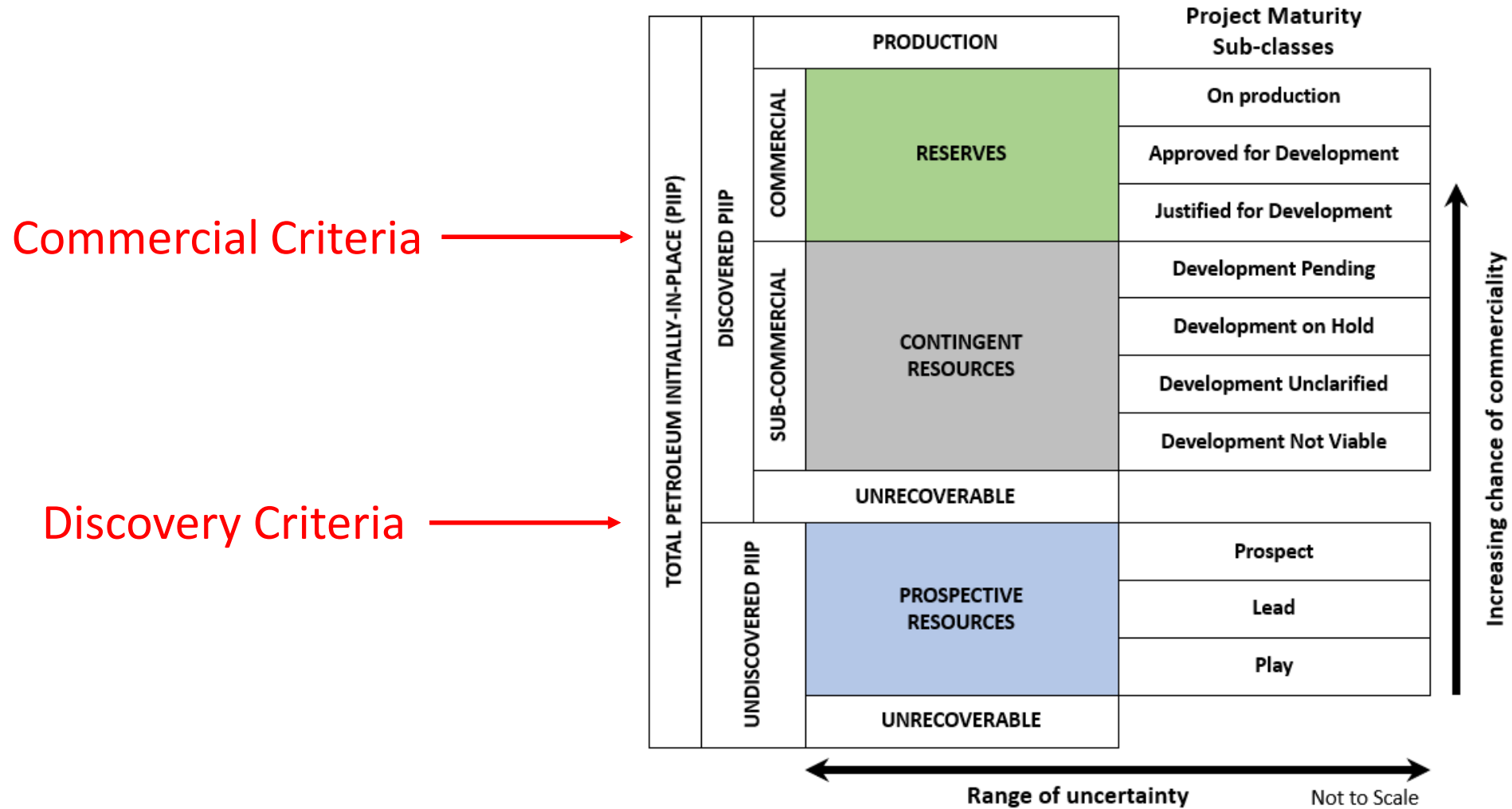
Classify by  
Chance of  
Commerciality of  
project

Categorise based on uncertainty of sales quantities



- Uncertainty will exist in all resources estimates
  - It cannot be avoided. However, it can be managed if it is recognised and understood
  
- Reserves: 1P, 2P, 3P
  - Proved, Proved plus Probable, and Proved plus Probable plus Possible
  
- Uncertainty relates to probability
  - 1P/Low: 90% probability (P90) that the quantities recovered will exceed this
  - 2P/Best: 50% probability (P50) that the quantities recovered will exceed this
  - 3P/High: 10% probability (P10) that the quantities recovered will exceed this
  
- Contingent Resources: 1C, 2C, 3C; Prospective Resources: 1U, 2U, 3U

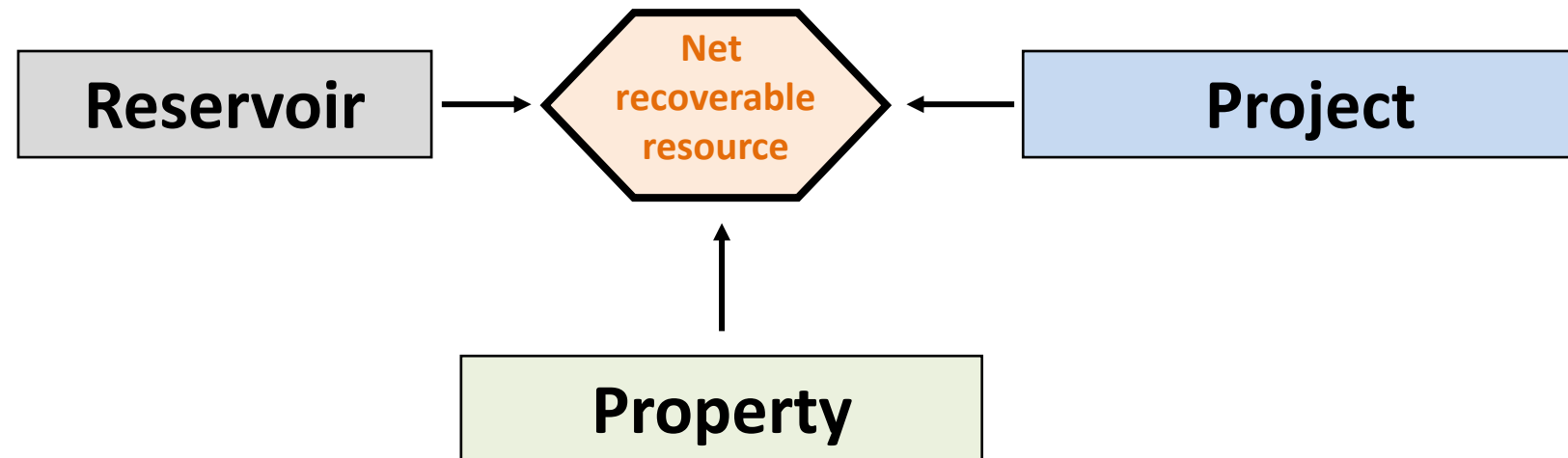
# PRMS Sub-Classes, based on project maturity



- Discovery
  - A well is needed to make a discovery!
  - Established through testing or sampling, the existence of a significant quantity of potentially recoverable hydrocarbons
  - Where there are no samples, logging and a suitable producing analogue can be used

- Commerciality requires evidence of:
  - A technically mature Field Development Plan
  - Finance in place, or expected
  - Intent to initiate development within a reasonable time frame
  - Meets economic criteria
  - A reasonable expectation of a market for sales products and acceptable treatment/disposal for other product streams (eg water, CO<sub>2</sub>)
  - Production and transportation facilities will be available
  - Evidence that all internal/external approvals will be forthcoming
  
- Positive project economics are only one part of Commerciality
  - A project can be economically attractive but not commercial

- Key elements of the PRMS:
  - Reservoir
  - Property
  - Project



FORBES > BUSINESS > ENERGY

## Turkey Finds Enormous Gas Field In The Black Sea — But Tricky Process Ahead

Ariel Cohen Contributor

*I cover energy, security, Europe, Russia/Eurasia & the Middle East*

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Sep 18, 2020, 08:52am EDT

In late August, Turkey's president Recep Tayyip Erdogan announced that the Turkish Petroleum Corporation (TPAO)'s FATIH drilling ship discovered a 320 billion cubic meters (bcm) i.e. 11 trillion cubic feet (tcf) of natural gas **reserves** in the Black Sea, within the western part of Turkey's Exclusive Economic Zone (EEZ). The reserve — identified to be within the Tuna-1 exploration zone — was discovered some 4,525 meters below the sea bottom, at near 2 km depth. News of the discovery has been welcomed in Turkey as a game-changer with regards to the country's expensive natural gas import bill.

While certainly a promising development for Turkey's energy security, important unknowns remain surrounding the economic viability of Tuna-1 (aka 'Sakarya'). According to investment banks, **the main issue is the economic extractable reserve value of the well and whether this value would justify costly deep-water upstreaming operations.**

## What are PROSPECTIVE RESOURCES ?

- They are a company's idea of where they should explore for hydrocarbons
  - Categorised as: 1U, 2U, 3U. Also as Low, Best Estimate and High
  
- A successful exploration well will confirm the presence of oil or gas
  - Volumes become Contingent Resources and possibly Reserves in future
  
- BUT there is a risk there may not be a discovery at all
  - Prospects each have a Chance of Success. A geologist might say this is 10% or 60%
  
- A Chance of Development is also applied

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## What are CONTINGENT RESOURCES ?

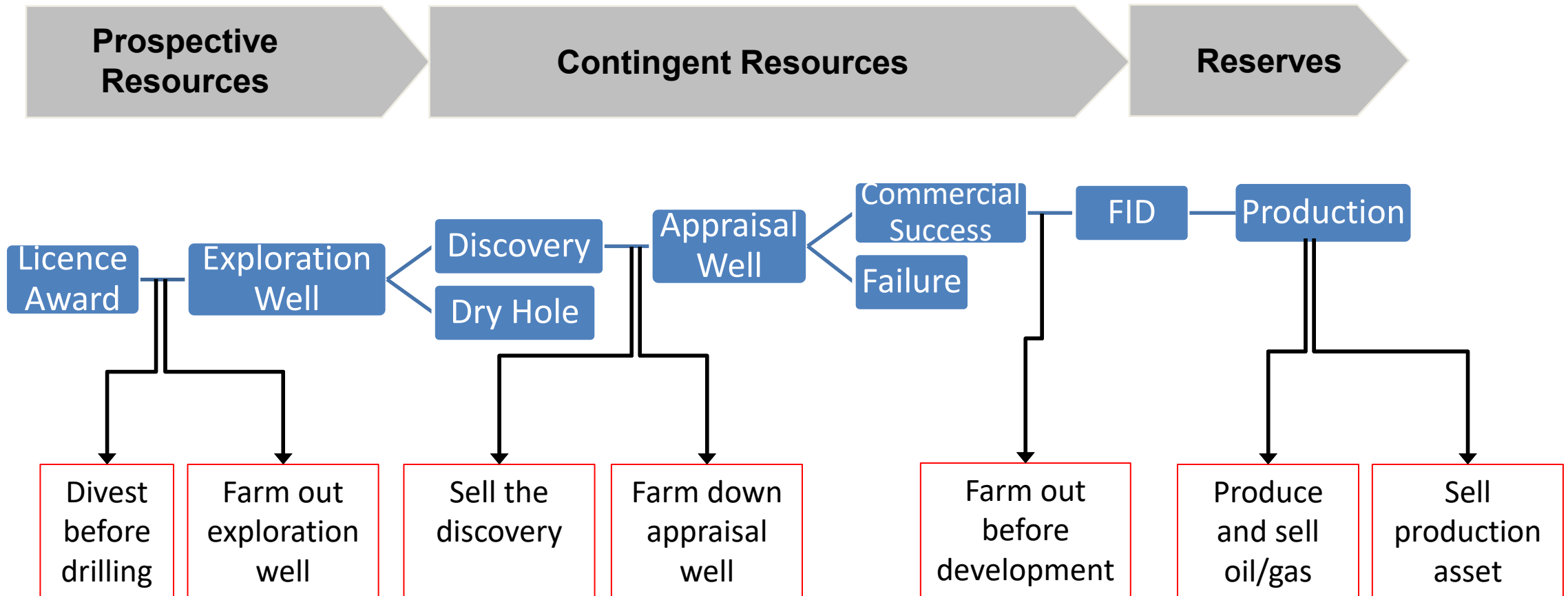
- A discovery with a development project not yet Commercial, due to one or more contingencies
  - Eg a gas field without a market for gas; or a field with high CAPEX making development uneconomic
  - Categorized as: 1C, 2C, 3C
- These can progress to become reserves in future, once they pass the Commerciality criteria
- The Chance of Development applies to these projects



- What are RESERVES?
- Volumes to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions
- Reserves must further satisfy four criteria: discovered, recoverable, commercial, and remaining based on the project
- The uncertainty range in Reserves estimates: 1P, 2P, 3P categories

- The PRMS does not indicate the content of a report. Each jurisdiction will have separate disclosure requirements
  
- Reserves experts write reports for many reasons, including:
  - Stock exchange requirements (LSE, AIM, SEC, TSX, ASX, OSE, SGX, etc...)
    - Annual reserves and resource reports
    - Competent Person's Report for take-overs, defence work, etc.
    - others
  - For financiers (banks and other lenders)
    - e.g. Reserves Based Lending
  - For investors/buyers of upstream assets

# Reserves and resources have value at each stage





*decisions with confidence*

## MASTERCLASS

# Portfolio Management in the Energy Sector

Gavin Ward,

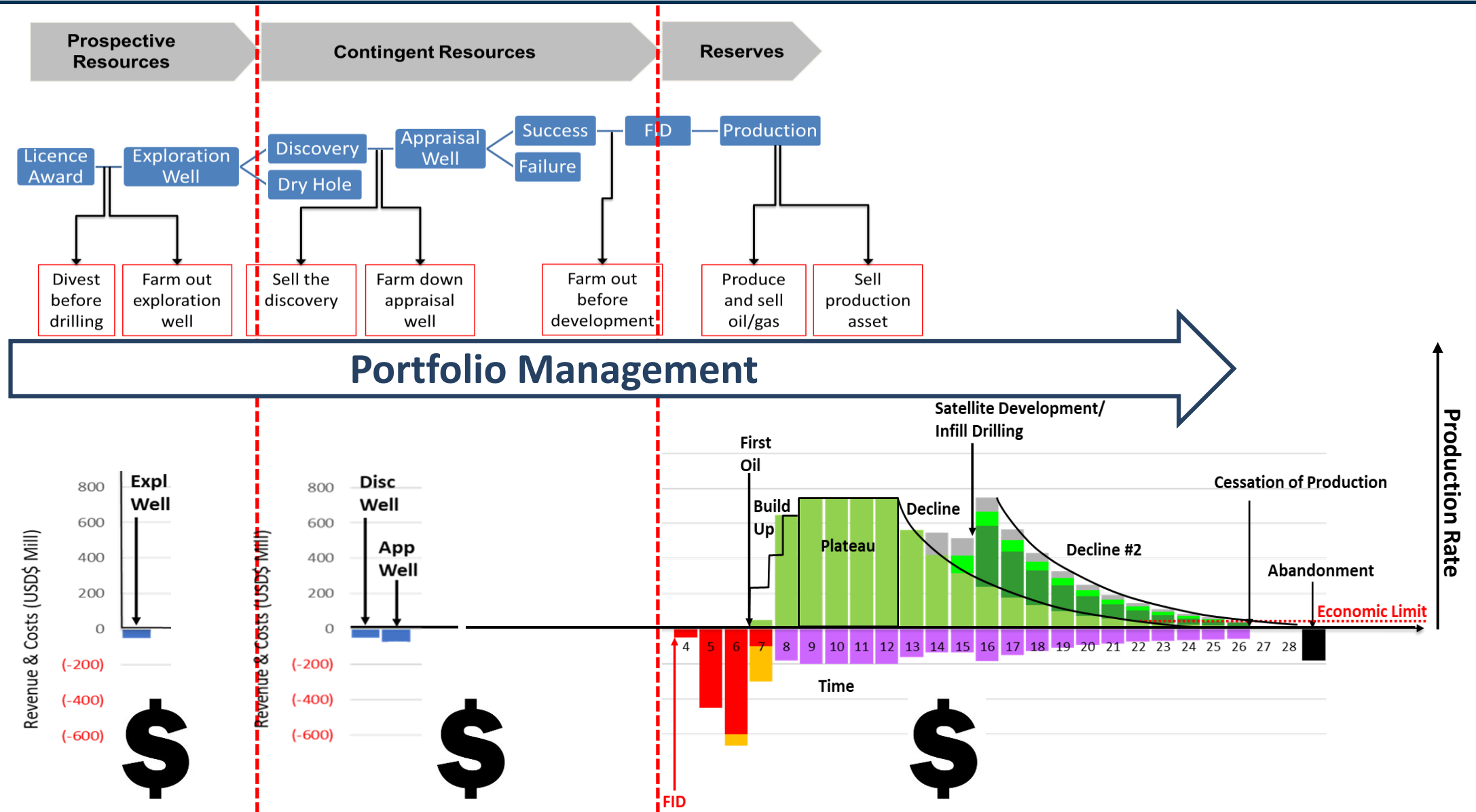
**Director & London Office General Manager**

Geoscientist & Economist

Fellow of the Association of Chartered Certified Accountants, FCCA

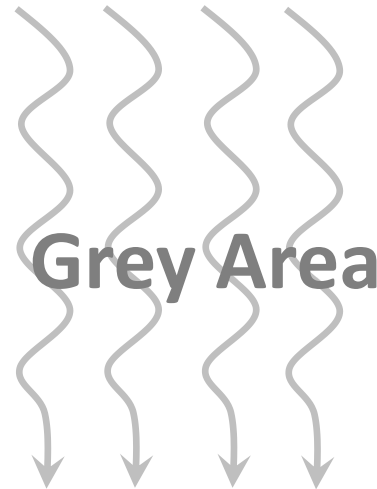


Wednesday, 21 June 2023





Decision Makers



Grey Area

$$2 + 2 = 4 \checkmark$$

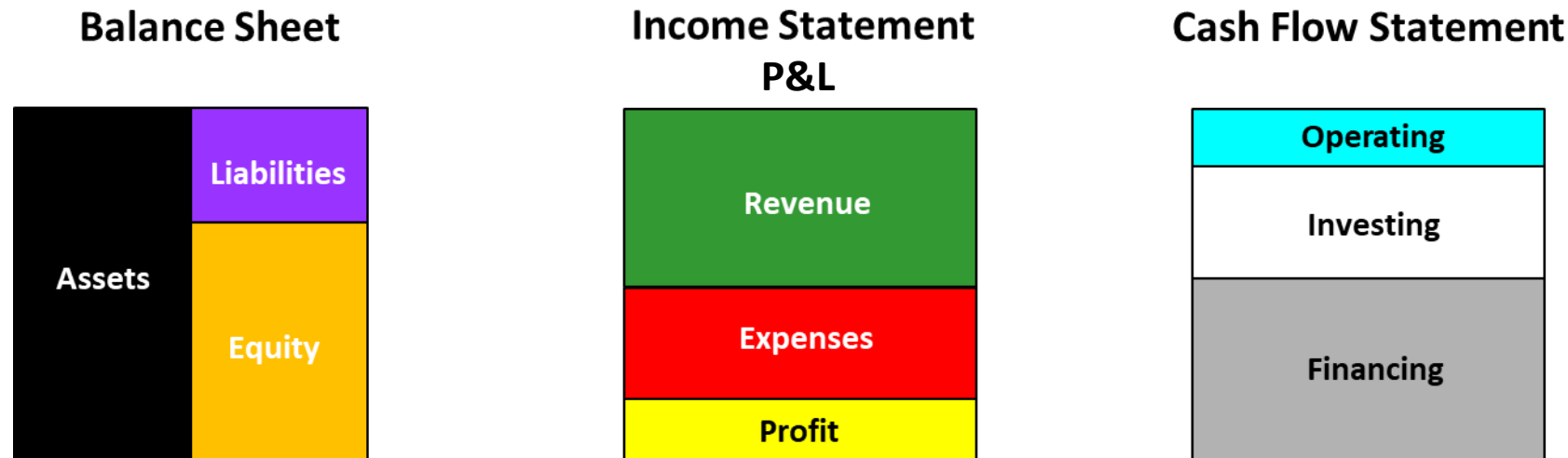
$$2 + 2 + a = x ?$$

$$2 - 2 = 4 \times$$

## Issues

- Requires management to steer towards required outcome
- Vulnerable to poor estimating
- Which decision tools: EMV, Monte Carlo, S-Curves, Binary decision making, Decision Trees?

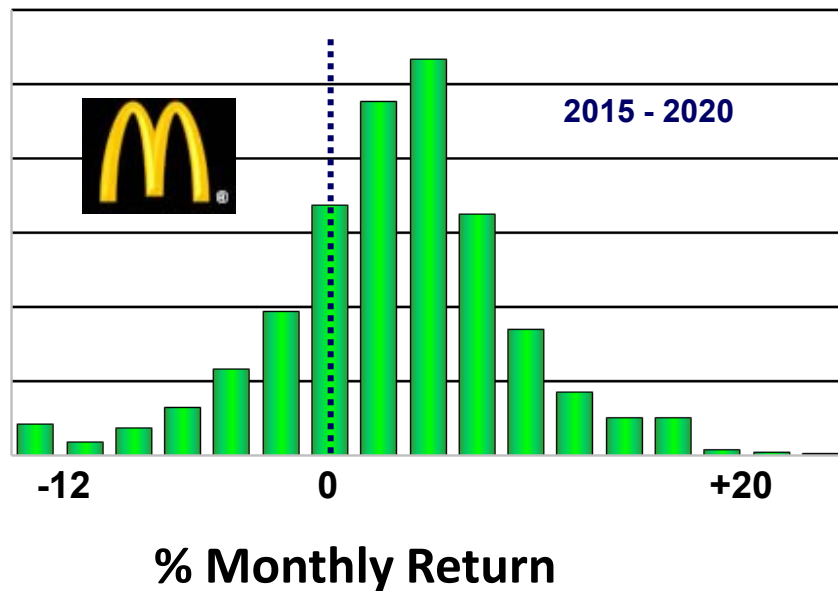
- **Capital:** Money which is allocated to the **Balance Sheet**
- **Expense:** Money which is allocated to the **Profit & Loss statement**



## Example

- Well drilled, discovery is developed: **Capitalised** on **Balance sheet** as an asset (Pg & Pc/Pe success)\*
- Well drilled, discovery not developed: **Expensed** in **Profit & Loss** as dry hole (Pg success, Pc/Pe failure)\*

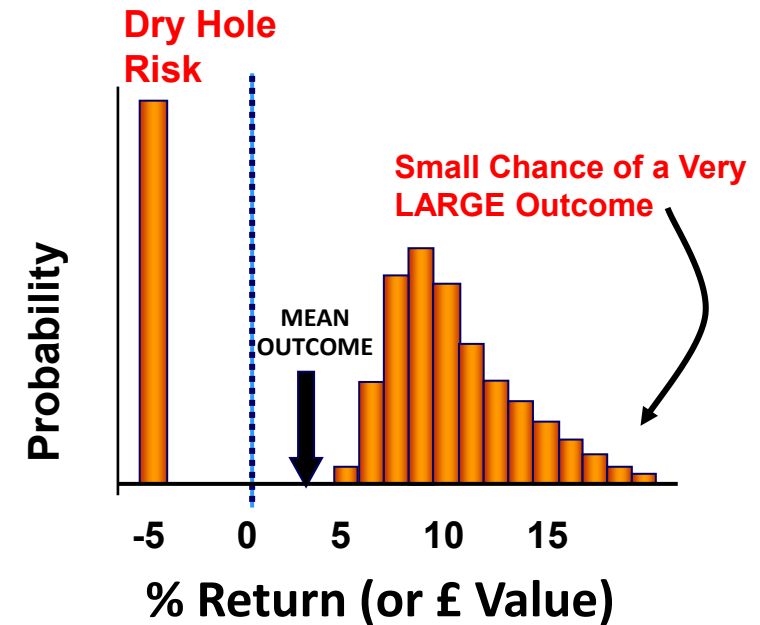
## Individual Stock



- Normal
- Main Risk: *Daily Volatility*

## Exploration Project

(& approx. 5% Dev wells)



- Lognormal
- Main Risk: *Total Loss*



- **Question:** How much of your own money would you bet on getting a 6 with one roll of the dice?
- **Question:** How much of your own money would you bet on getting a 6 with 10 rolls of the dice?
- **Answer:** The more rolls you get, the more confidence you have of achieving the desired outcome

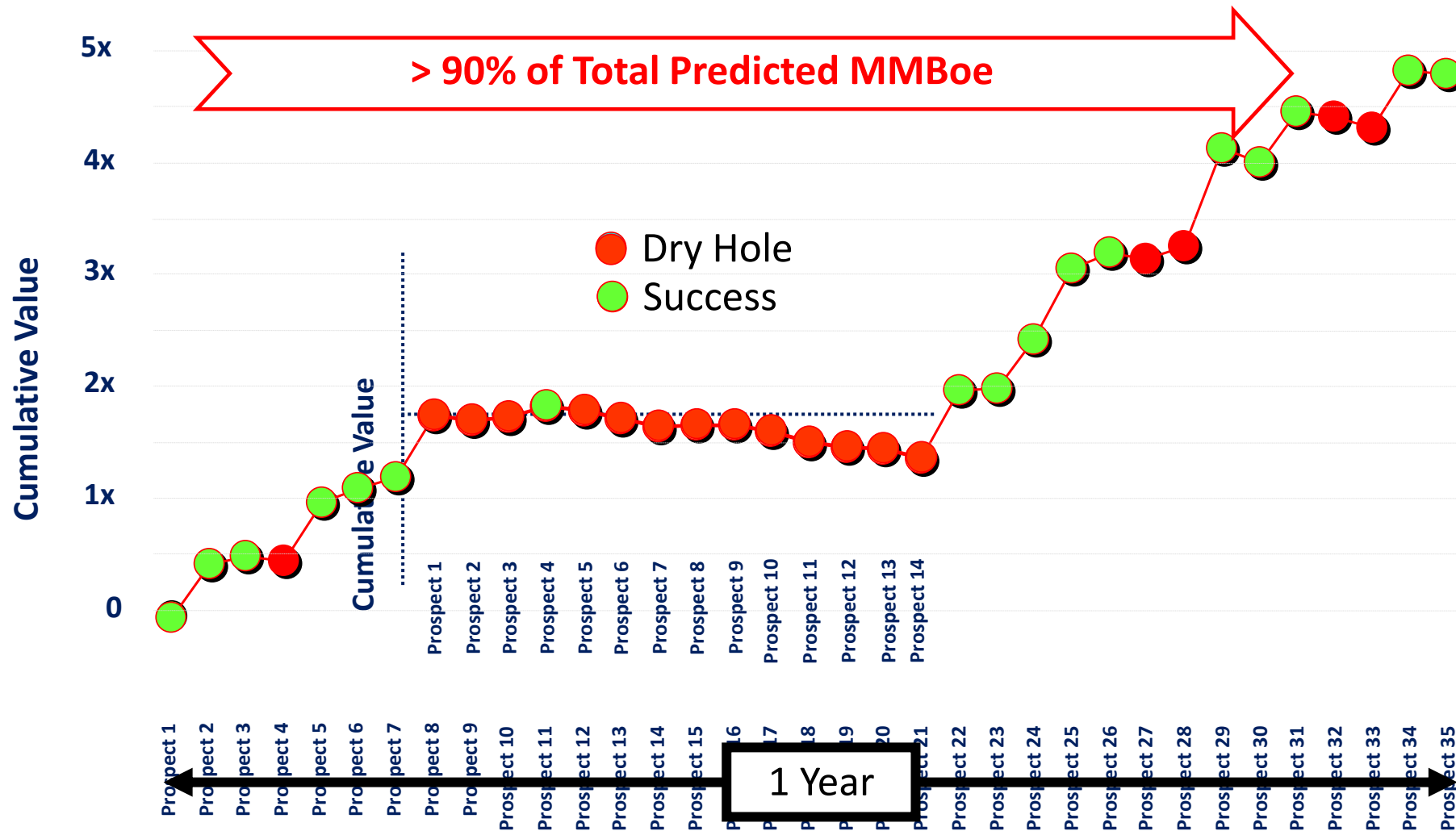


## Conclusion

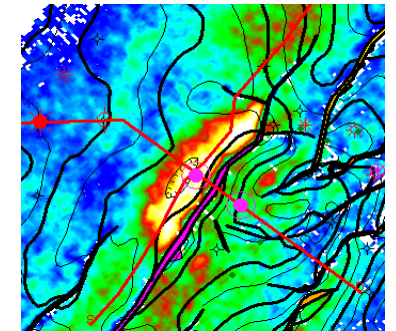
- Better to have 10 investments at 10% working interest rather than one investment at 100% working interest, if you want to be confident of success/return and predicting outcomes



# Prediction: Real Company Example with 35 wells

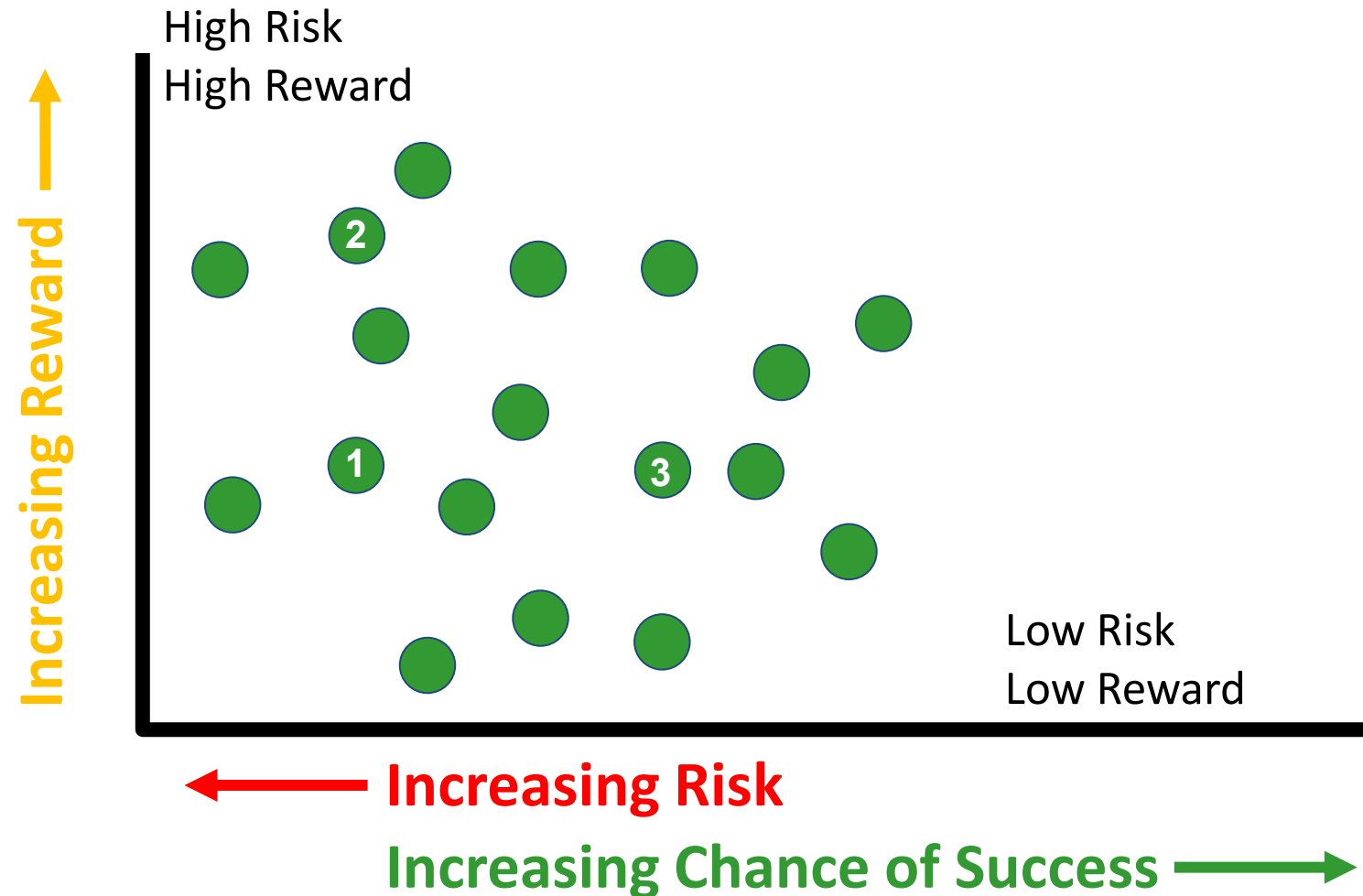


Onshore, Gulf of Mexico, USA

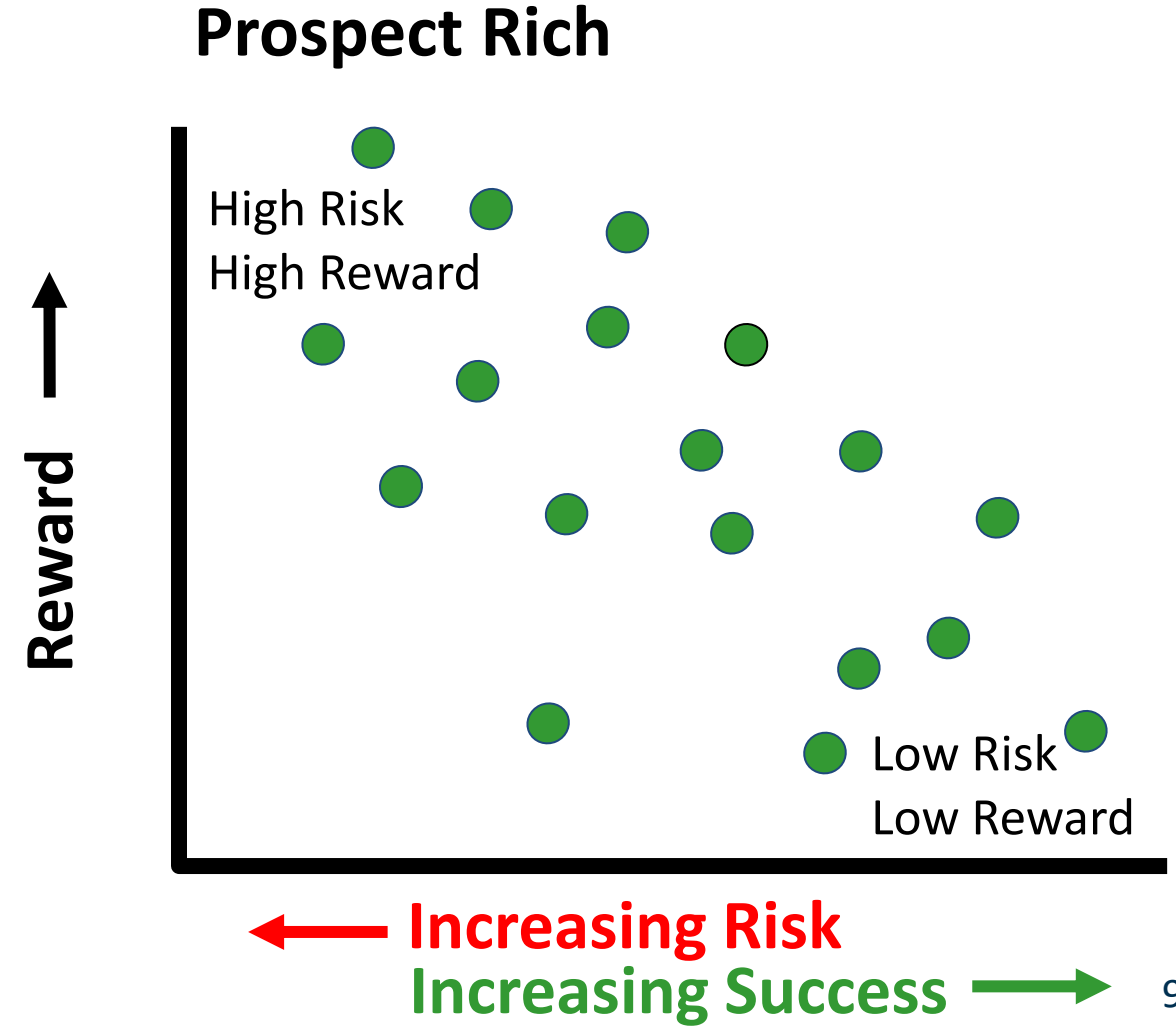
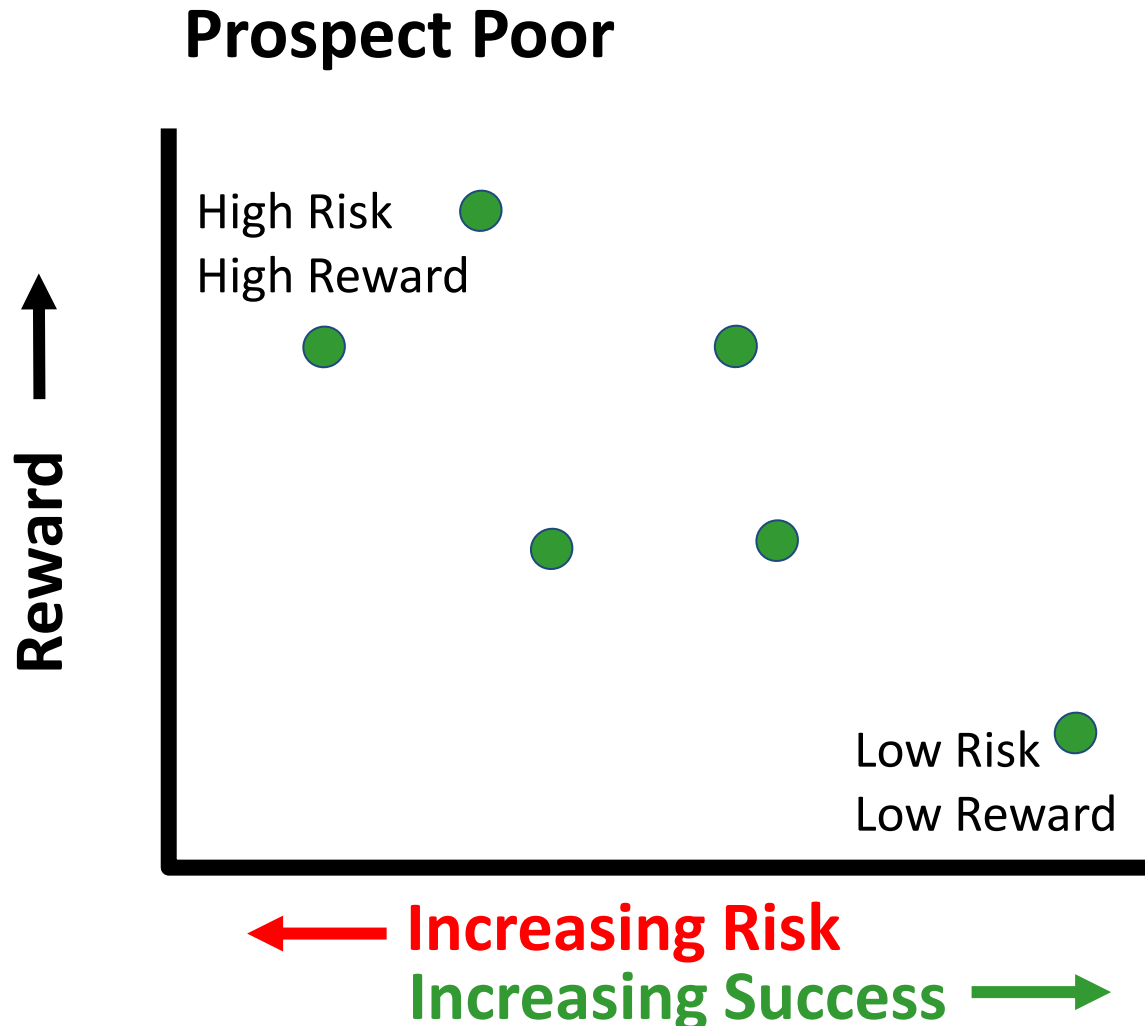


# Portfolio Theory: Basic Principle of Risk v Reward

- **Basic Principle** = If taking more risk, investor wants more reward



Adequate capital for 5 projects: Which portfolio stands a better chance ?



## Diversification V Focus

- Diversify risk v Spread too thin
- Focus effort v All Eggs in one basket

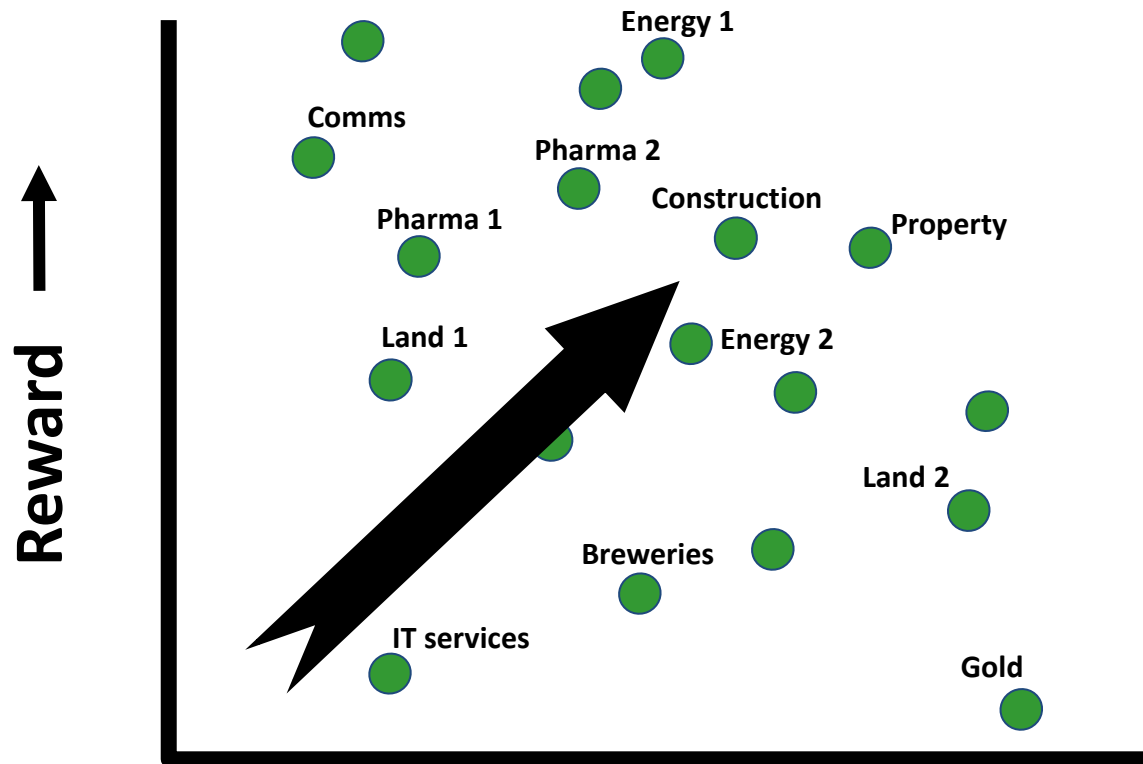
**Healthy** = Prospect-rich, not prospect poor (need to mature prospects)

- Then Capital Constraint is our friend as it forces selectivity;
- **BUT** Capital Constraint can have a dark side if it retards maturation.

## Diversification is our friend

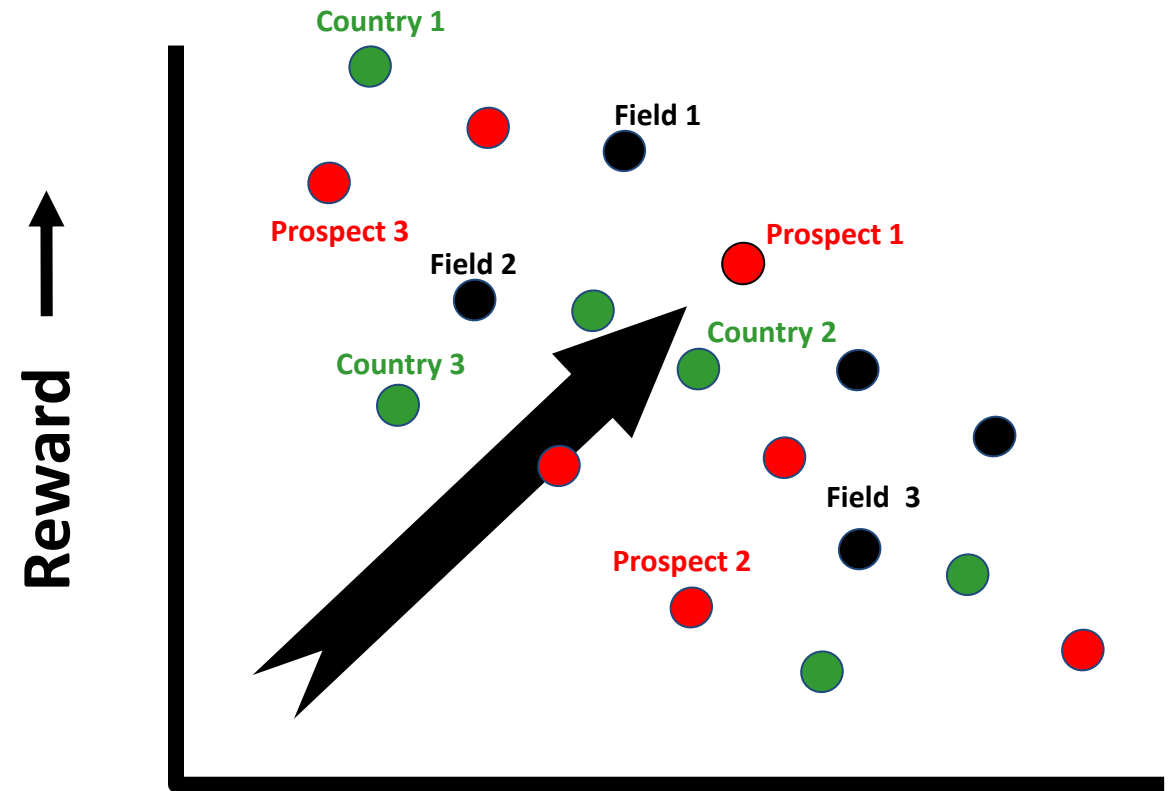
- Base Production vs. Growth
- Enough High-Risk Swings, independent of one another
- **BUT** not over-diversified (Staff and Resources)

## PORTFOLIOS of SHARES



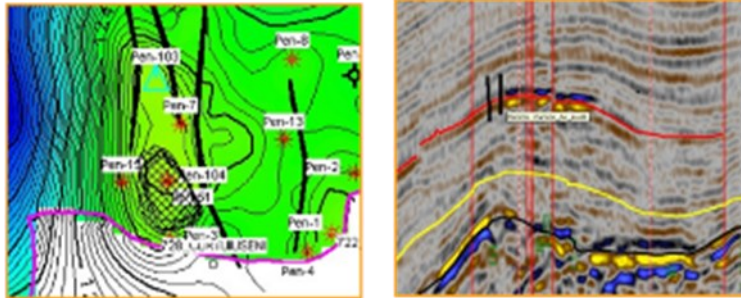
← Increasing Risk  
Increasing Success →

## PORTFOLIOS of PROJECTS

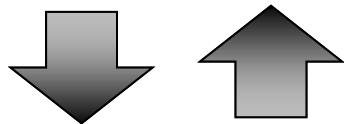


← Increasing Risk  
Increasing Success →

## 1. Prospect Identified



## 2. Probabilistic Risk and Resources Calculated with Standard Software

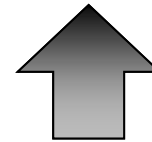


## 3. Peer Review Meeting



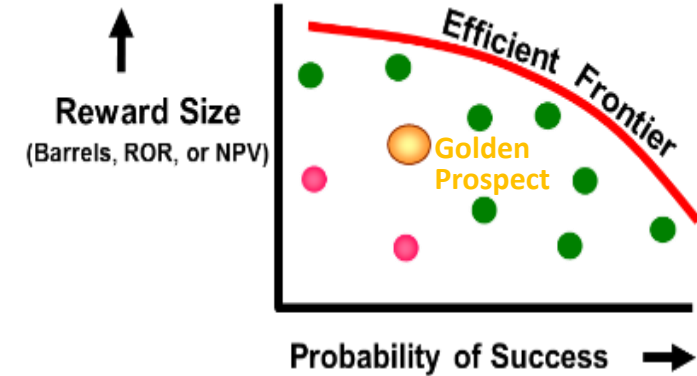
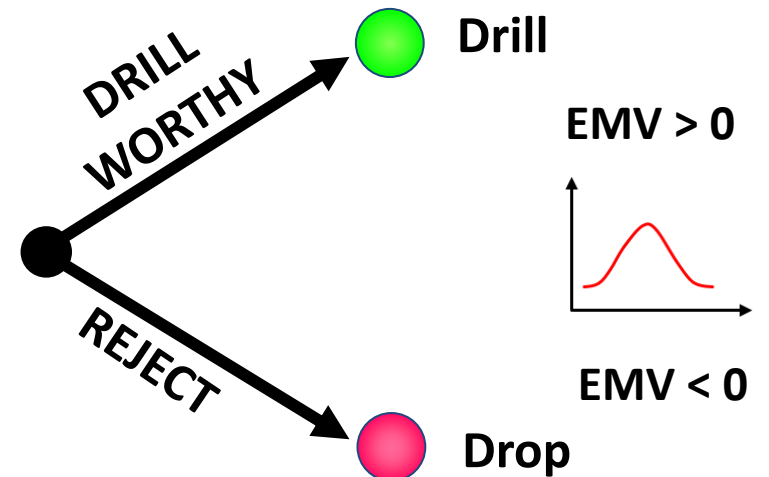
## 5. Compare to Portfolio

Better Method



## 4. Prospect Technically Mature

Poor Method



# Portfolio Theory: Planned Investment Programme (Exp, App & Dev)

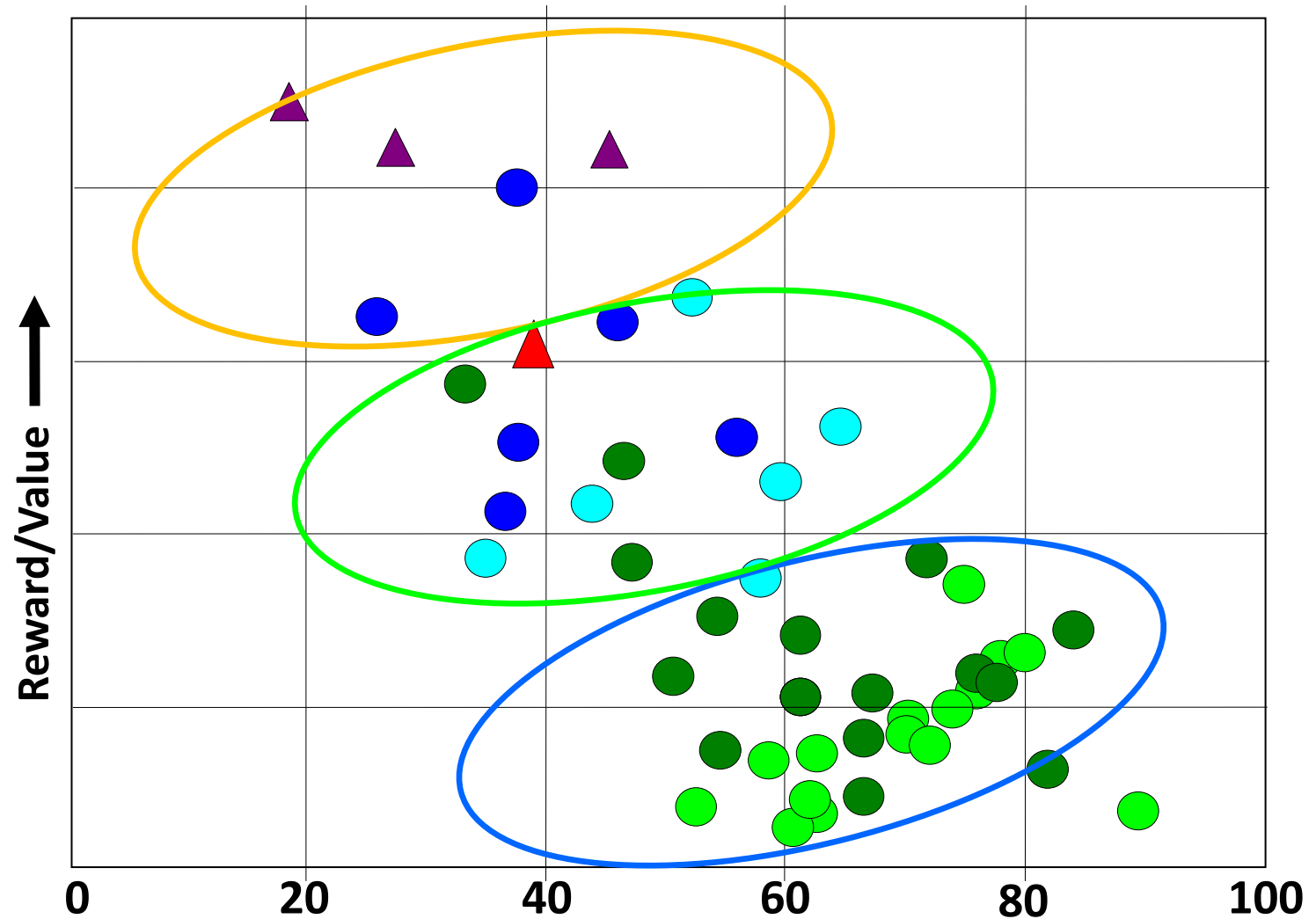


Projects, coloured by Business Unit

Company Growth

Modest Growth

Base



**Key**

- Deepwater GOM
- Offshore Shelf GOM
- Onshore USA
- Onshore USA
- ▲ International
- ▲ International



# Portfolio Theory: Real Investment Programme

## Company-Makers

- > 4 yr. timeframe
- High-Risk

Company Growth

## Modest Growth

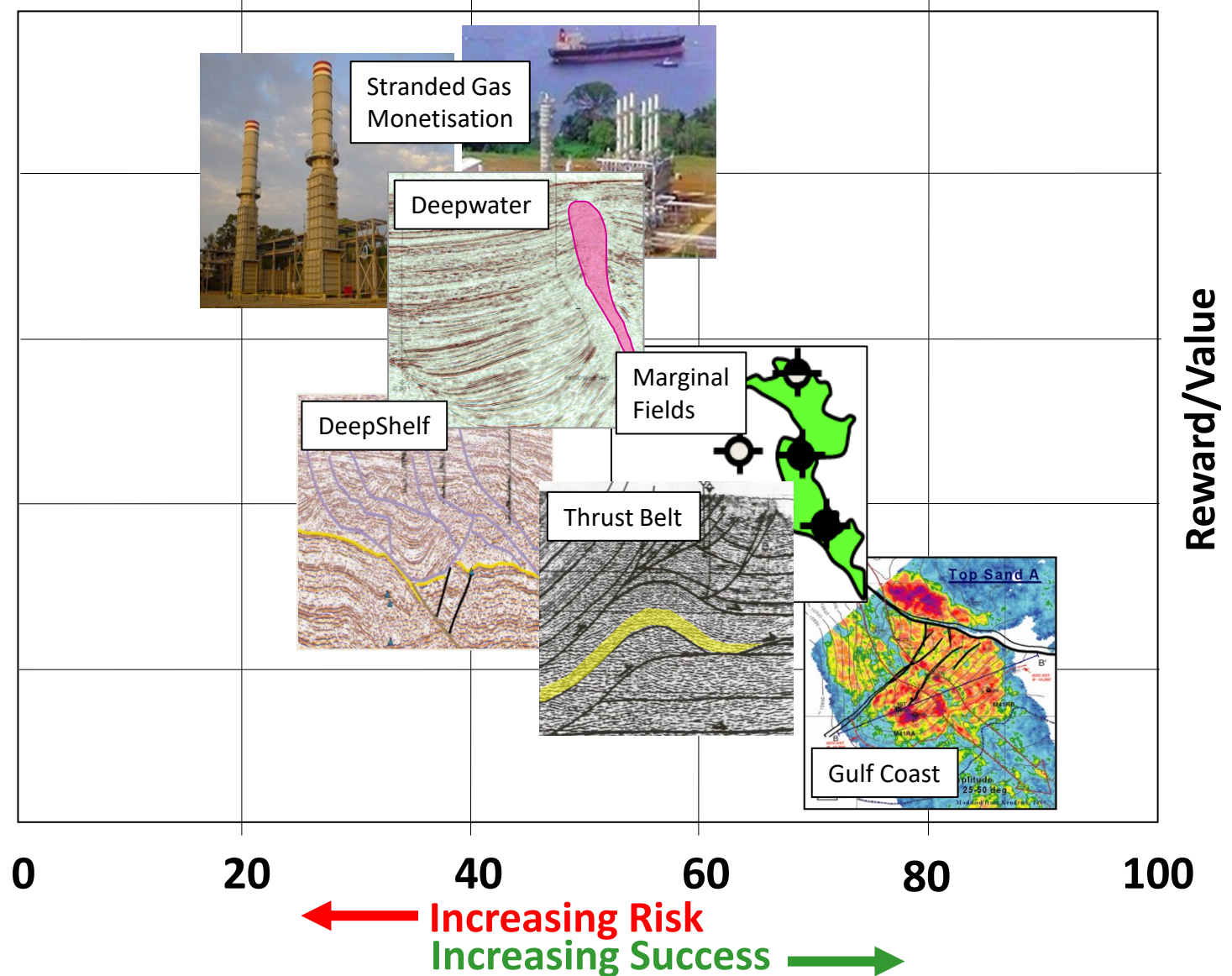
- 2-5 yr. timeframe
- Predictable "Insurance"

Modest Growth

## Base Production Replacement

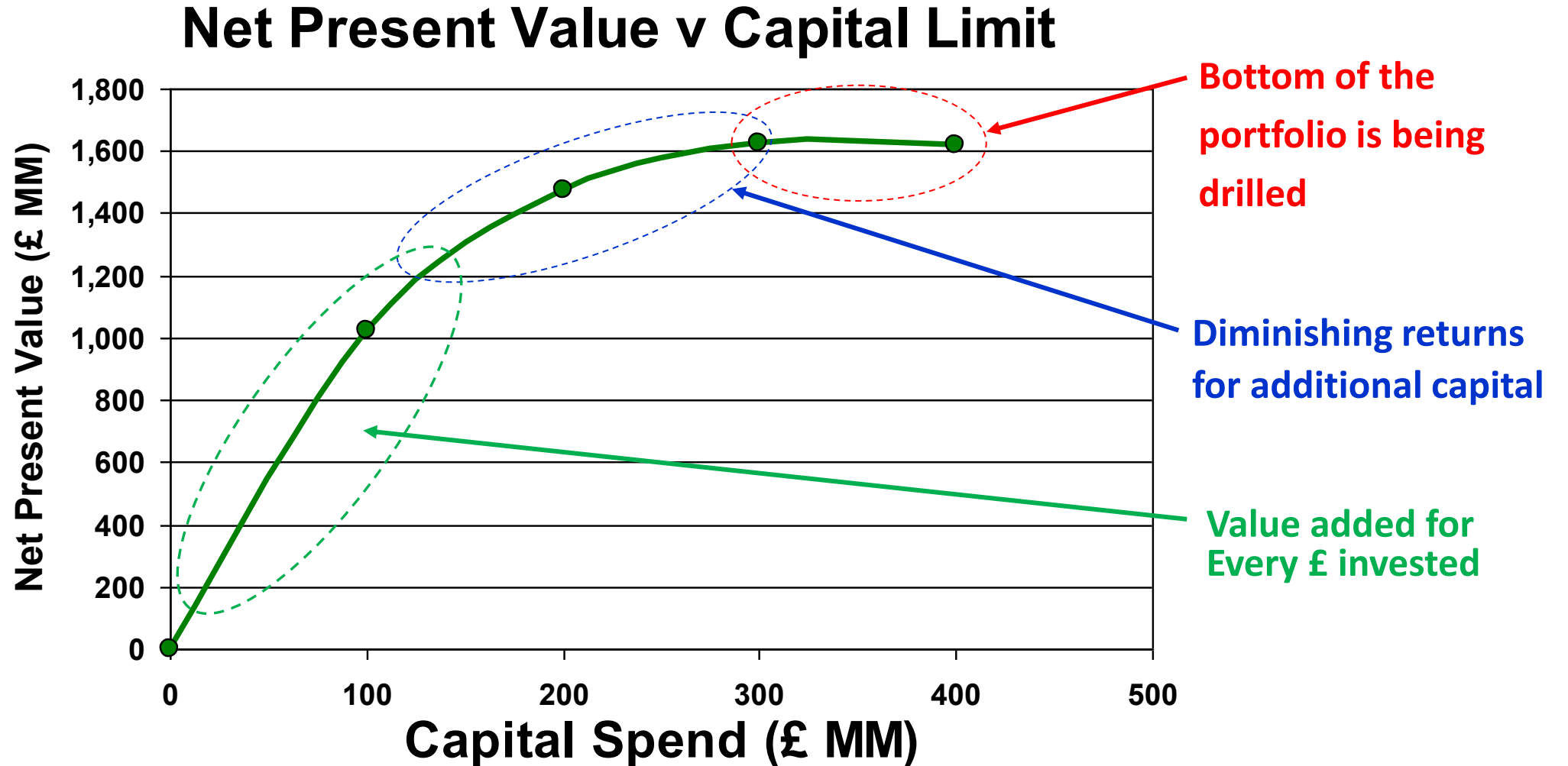
- Onstream quickly
- Low-Risk, high predictability

Base

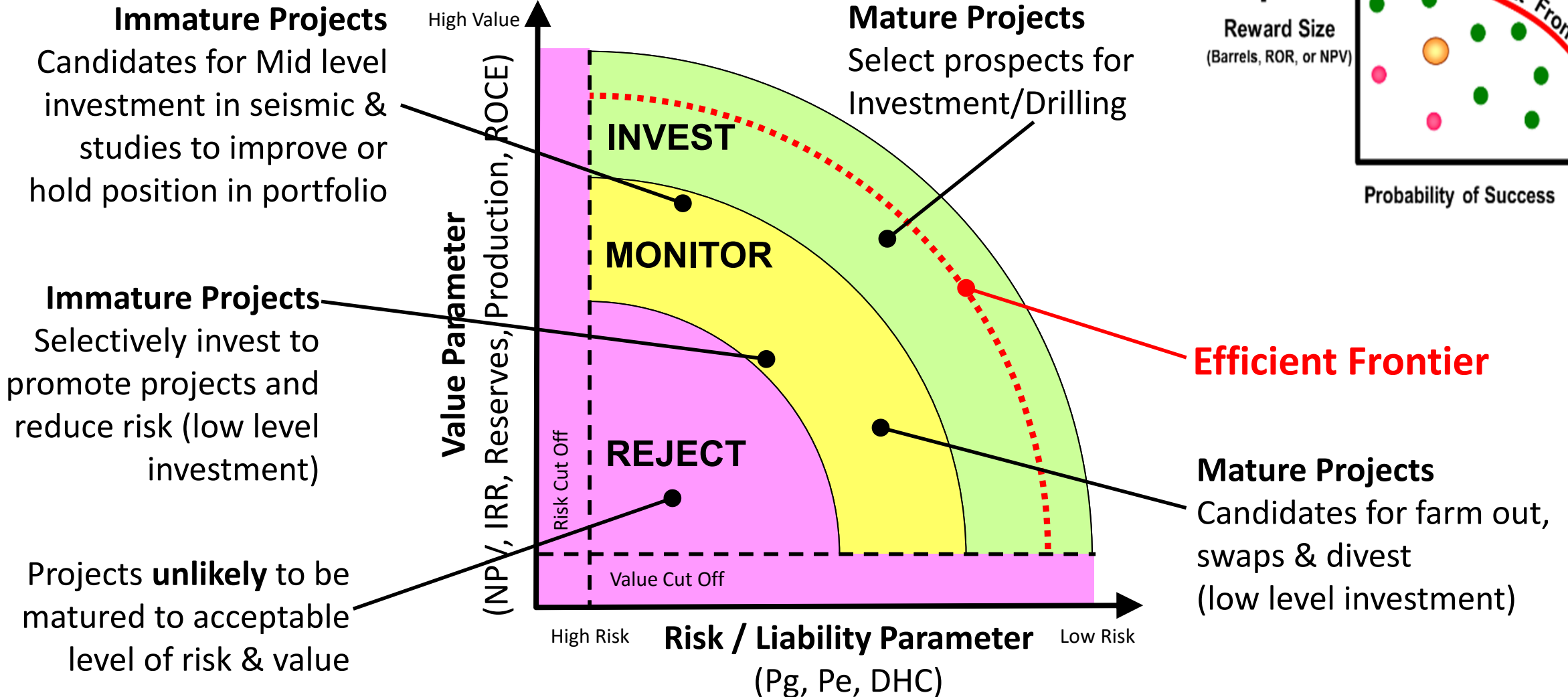


- Maximising is rarely best

Real Portfolio 2003



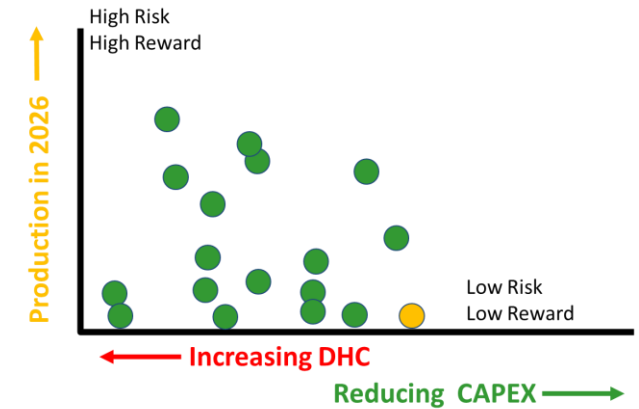
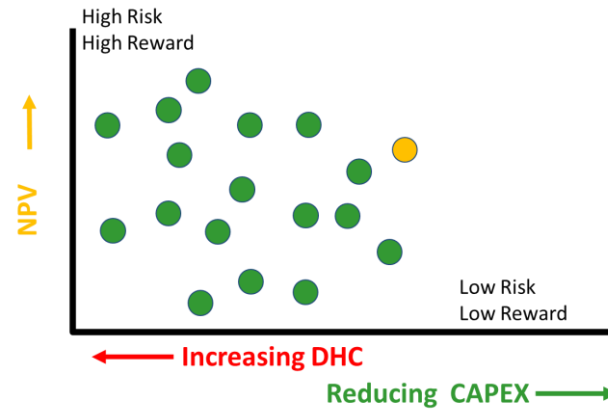
- **Targets** usually set for: Maximise production/Reserves/NPV
  
- **BUT** ~~sometimes~~ asked to achieve the impossible:
  - Maximise NPV, and
  - Maximise Production, and
  - Minimise Capex or Dry Hole Cost, and
  - Achieve > 100% reserves replacement.....
  
- **Optimisation** of the portfolio metrics = **Trade offs** required:
  - P90 confidence in production target but only P50 confidence in NPV for given Capex
  - .....or.....
  - P80 confidence in production target and P75 confidence in NPV for given Capex
  
- **Discussion** of Trade-offs required



# Portfolio Selection: Project Types & Trade Off

Which project would/should you invest in?

UNDISCOUNTED CASH FLOWS			DISCOUNTED CASH FLOWS@10%		
Year	A	B	Discount Factor	A	B
1	(-30)	(-100)	1.000	(-30)	(-100)
2	20	(-200)	0.909	18	(-182)
3	14	(-80)	0.826	12	(-66)
4	10	90	0.751	8	68
5	7	150	0.683	5	102
6	5	150	0.621	3	93
7		110	0.564	0	62
8		80	0.513	0	41
9		60	0.467	0	28
10		40	0.424	0	17
<b>Net Cash Flow</b>	<b>26</b>	<b>300</b>	<b>NPV</b>	<b>15</b>	<b>63</b>



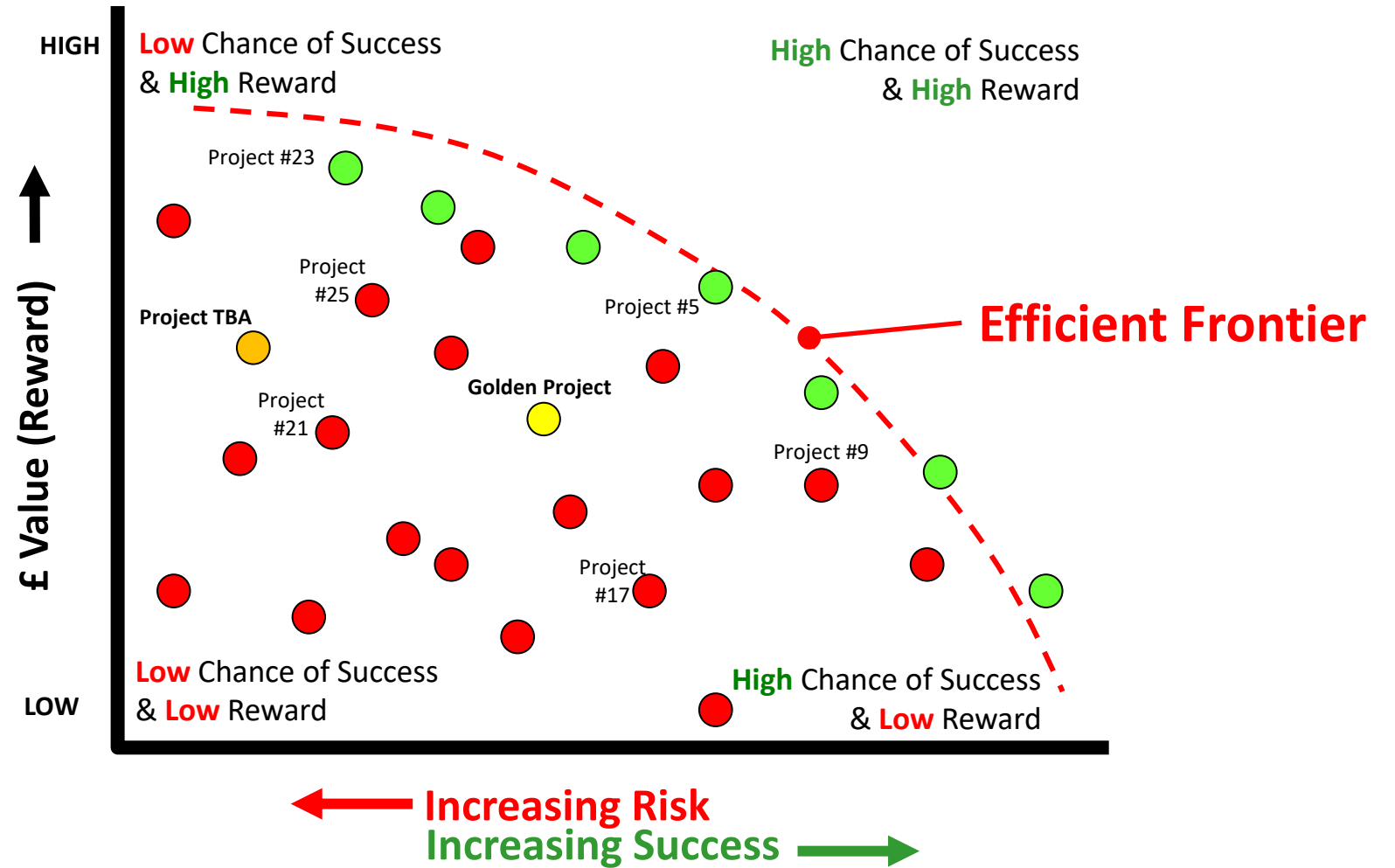
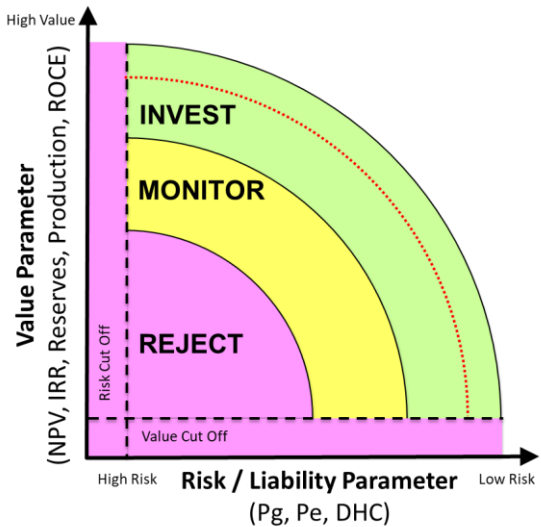
**Project A:** NPV10 = \$15 million, IRR = 35% (typical onshore project)

**Project B:** NPV10 = \$63 million, IRR = 15% (typical offshore project)

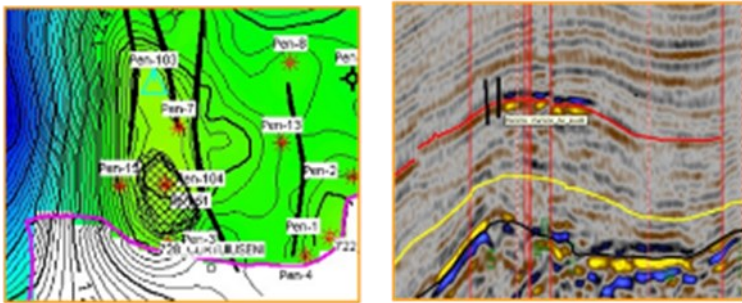
# Human Bias in Project Selection

- Efficient Frontier maximizes the return for the risk

● **Select**  
● **Reject**



## 1. Opportunity Identified



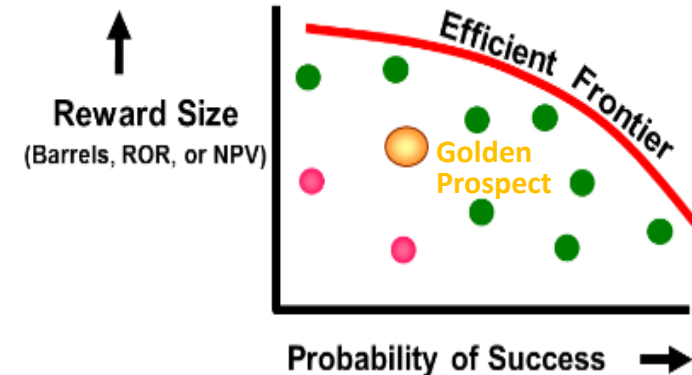
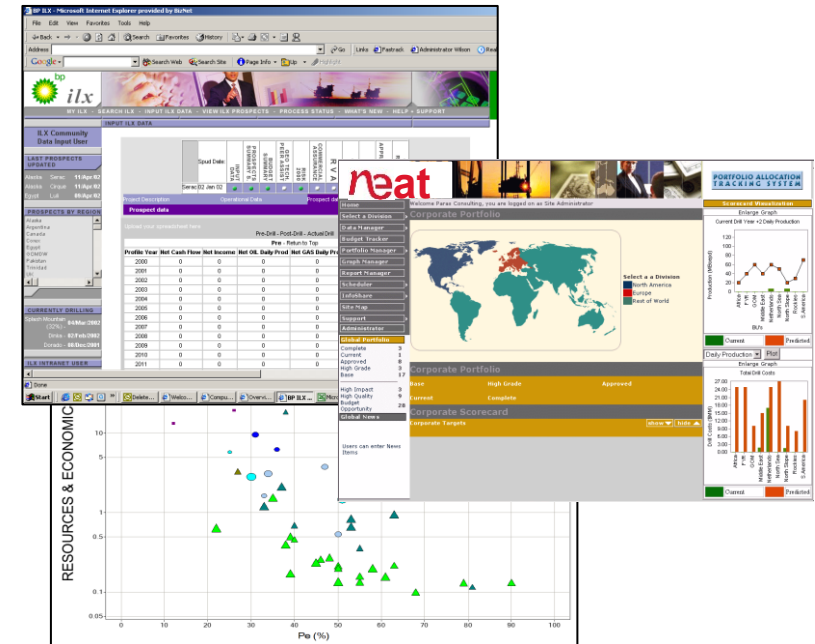
2. Probabilistic Risk and Resources Calculated with Standard Software + Peer Assists

3. Peer Review Meetings

6. Corporate & B.U.L's review entire portfolio

5. Business Unit Manager High Grade

4. Prospect Technically Maturing





**SHELL**<sup>1</sup> (Mkt Cap approx. \$200 billion<sup>2</sup>)

**Main Focus** = Validating numbers & Consistency

- Capital Allocation Form = PMaster
- Diff start date (50%), Economics (20%), price files, etc
- Inputs = Prod, Capex, Opex, NPV etc
- Compiled by Capital Allocation team April/May to Sept/Oct
- Capital Allocation team pass on to Strategic team
- Strategic team high grade against strategy

**Metrics** = VIR, Reserves Replacement, ROCE

**Selection** = Commitments, “No Brainers”, and subjective discussion with managers & directors

**Final Choice** = CEO/Unit Heads intervene with CEO



**Noble Energy** (Mkt Cap approx. \$15 billion<sup>2</sup>)

**Main Focus** = Validating numbers & Consistency

- Central database = NEAT
- Version control of subsurface figures, Units of inputs
- Inputs = P90, P50, Mean, P10: Prod, Capex, Opex, NPV etc
- Compiled by three-person team June to Aug
- Data validation team same as Portfolio Team
- 2 day closed meeting with 1-2 Senior VP’s, 6 Business Unit Mangers & 6 Finance Managers to High Grade

**Metrics** = Rw DHC, NPV, PW/Invest, Production

**Selection** = Commitments, “No Brainers”, and subjective discussion with managers & Senior VP’s

**Final Choice** = Senior VP’s with advice from Portfolio team (some minor late intervention)





**Adam Borushek**

Adam.Borushek@riscadvisory.com



**Gavin Ward**

Gavin.Ward@riscadvisory.com

**Reserves**

**Portfolio**



**Perth**

Level 2  
1138 Hay Street  
WEST PERTH WA 6005  
P. +61 8 9420 6660  
E. admin@riscadvisory.com

**Brisbane**

Level 10  
95 North Quay  
BRISBANE QLD 4000  
P. +61 7 3025 3397  
E. admin@riscadvisory.com

**London**

Level 2  
20 St Dunstan's Hill  
LONDON UK EC3R 8HL  
P. +44 (0)203 795 2900  
E. admin@riscadvisory.com

**South East Asia**

Jakarta  
Indonesia  
P. +61 8 9420 6660  
E. admin@riscadvisory.com

