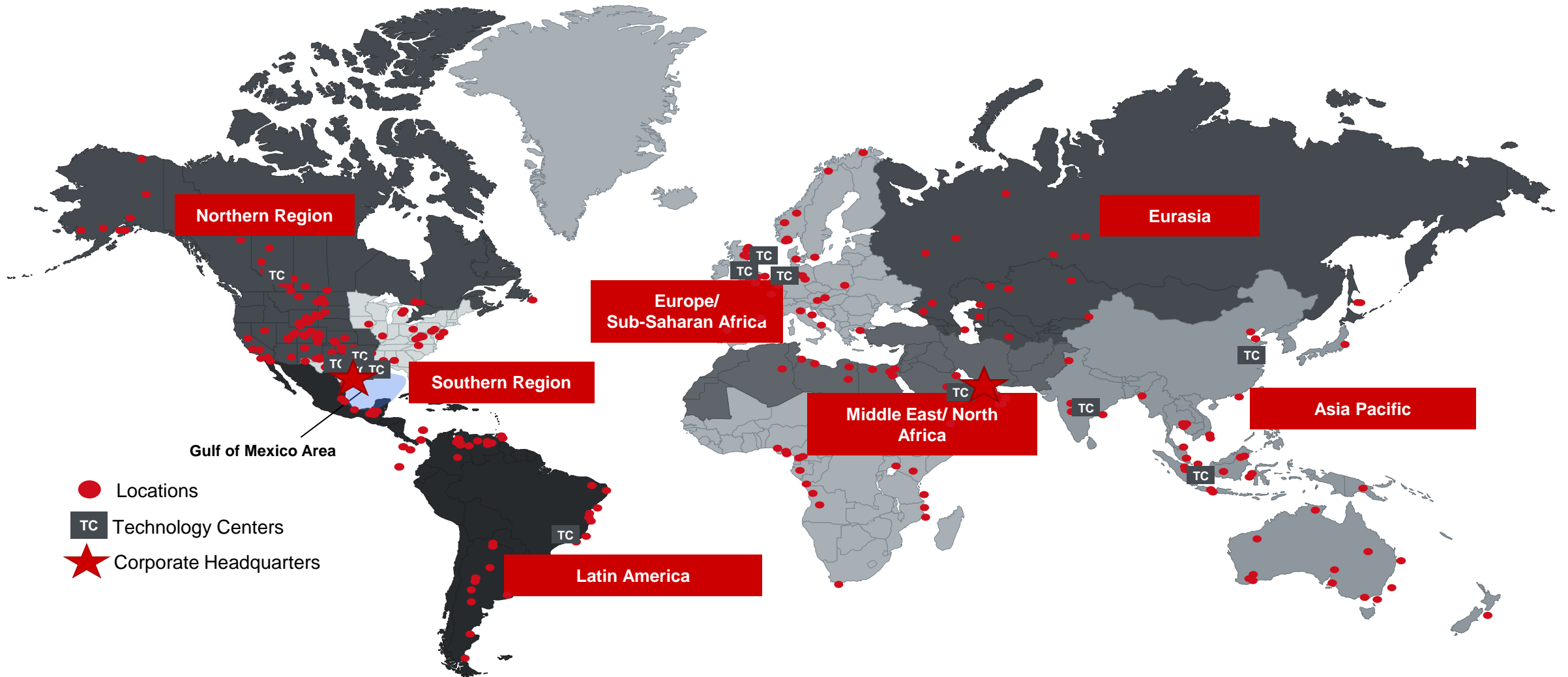


SPE Seminar: Introduction to E&P
Economics & Commercial

November 21st, 2017

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Halliburton Global Footprint



DID YOU KNOW

SOMETIMES THE MOST IMPORTANT WORK YOU CAN DO IS TO STOP WORKING.

If you're working and you see a process that is not being followed correctly, or if you notice at-risk behavior going on, take the initiative and call a quick time-out. Then confer with your workmates to make sure everyone knows the safe way to continue.

Executing Stop Work Authority to right safety wrongs and catch potential unsafe action before it actually happens is not only responsible, it's also effective. In fact, in the oil and gas industry, it's been one of the most successful approaches to safety in the last decade.

Empower the people around you. Encourage them to watch for unsafe conditions or processes, and when it's necessary, stop the job until it can be done safely.



At Halliburton, solving customer challenges is second only to keeping everyone safe and healthy. You can find more safety tips at www.halliburton.com/HSE.

Safety Moment Subject suggested by: Brent Johnson, *Halliburton Employee*

Overview of E&P Economics & Commercial

1

- Why is it necessary?

2

- When is it required?

3

- Who does it?

4

- What inputs are required?

5

- How is it performed?

6

- And so what?

Why is it Necessary?...1/3

- **Project Feasibility & Capital Allocation:**

- To assess the inherent E&P project and decision risks
- To evaluate investment returns & to make informed decisions on how to efficiently allocate capital
- Used for:
 - Field Development Plans (FDP),
 - Final Investment Decisions (FIDs)
 - M&A activities

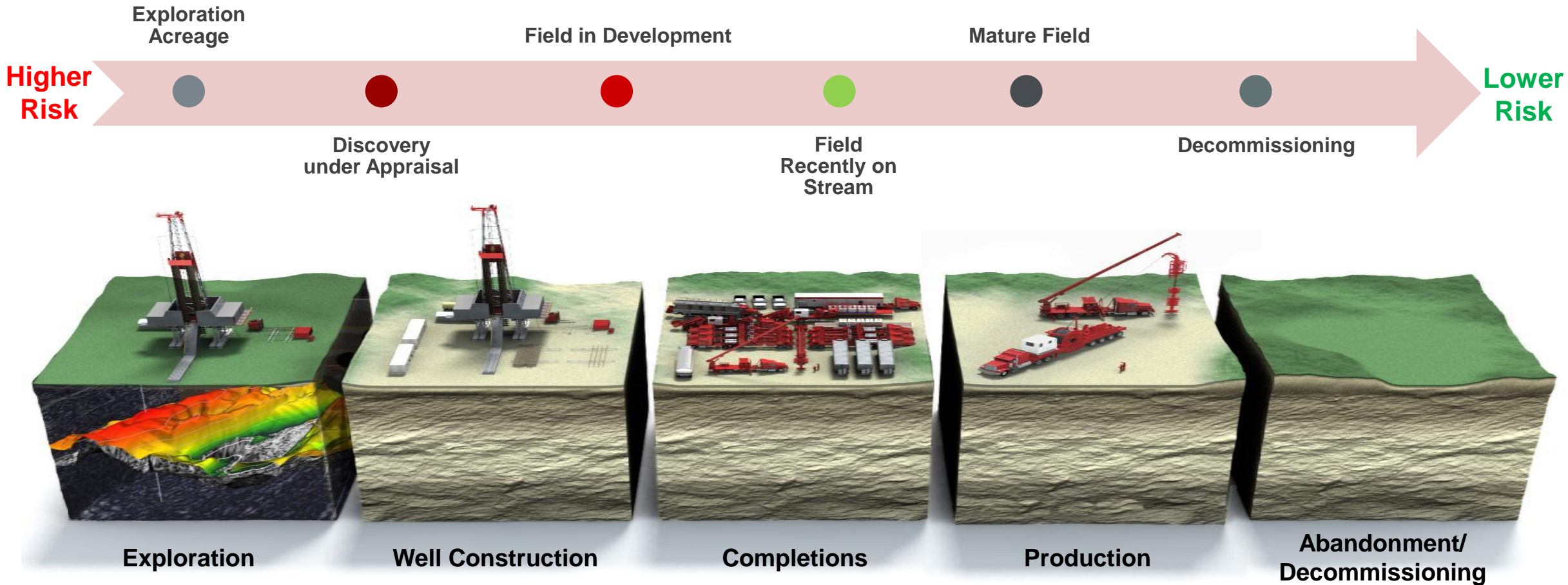
- **Reporting Requirements:**

- Reserves Report/Audit
- SEC Filings
- Competent Persons Reports (CPRs) for:
 - IPO
 - Project Finance

- **License Round Participation**

Why is it Necessary?...2/3

Risk & Value Assessment



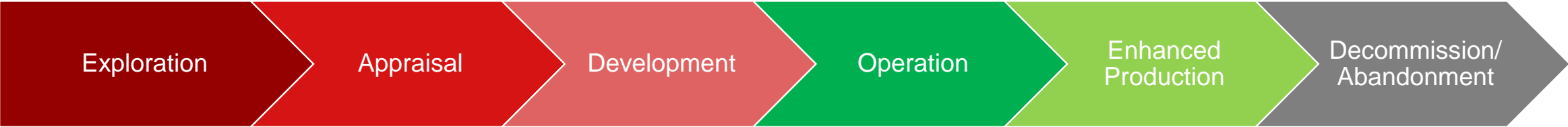
These risks are dependent on where we are within the E&P lifecycle

Why is it Necessary?...3/3

- **To assess the inherent E&P Project & Decision Risks (Project Feasibility/Valuation)**
 - Where to explore?
 - Where to drill?
 - Should we drill again after a dry hole?
 - Is a discovery worth appraising?
 - Should we develop what we have found?
 - If so, how should we develop it?
- **To evaluate investment returns & to make informed decisions on how to efficiently allocate capital**
 - How do we finance it? Equity or Debt?
 - Should we keep it, seek a partner or sell it?
 - How do we extract the most value from it?
 - When should we shut it down?
 - How do we evaluate risk?
 - How do we ration capital?

When is it Required?

Field/Asset Lifecycle



- Acquiring rights
- Geological,
- Gravimetric
Magnetic,
- Seismic surveys
- Exploration
Drilling

- Further seismic surveys
- Appraisal drilling
- Studies
- Geological modeling
- Initial economic appraisal

- Concept selection
- Detailed economic appraisal
- Detailed Engineering
- Financing
- Development drilling
- Facilities
- Pipelines

- Produce
- Process
- Transport
- Sales

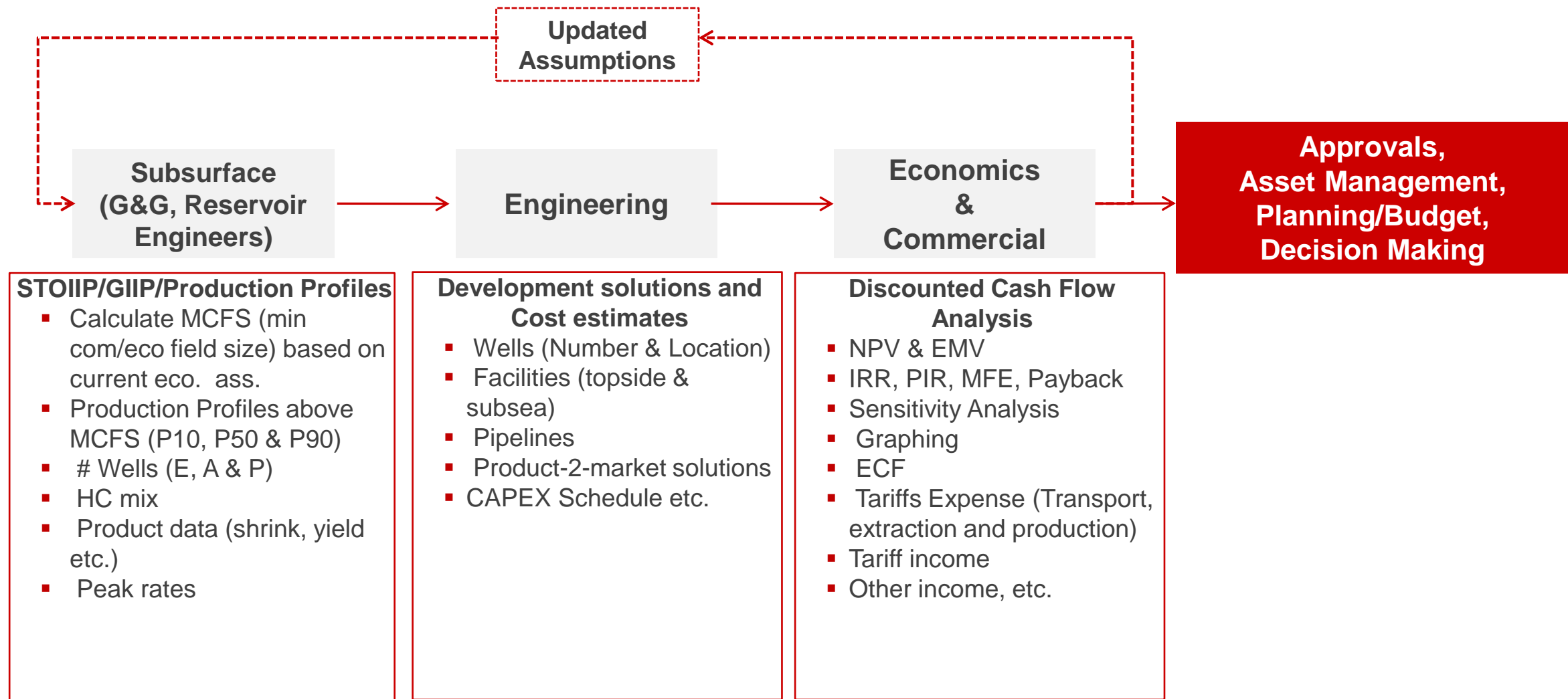
- Maximize recovery
- Tertiary Recovery
- Extend field life using Enhanced Oil Recovery (EOR) techniques

- At end of economic life safely and cleanly plug and abandon wells
- Decommission and dispose of facilities and pipelines

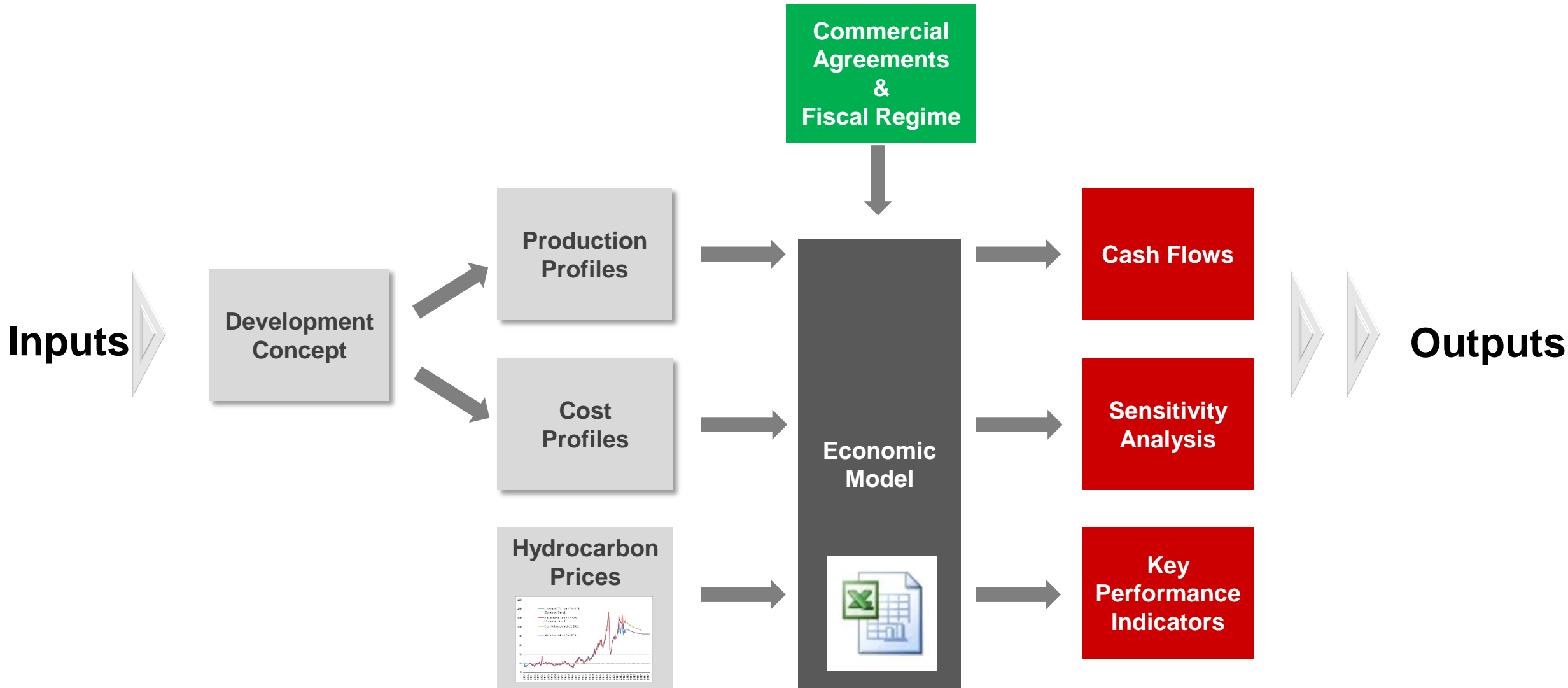
At every point during the E&P Asset Lifecycle to ensure value creation and delivery

Who Does It?

An Integrated Workflow & Team is highly recommended



What Inputs are Required?



There are three main types of Oil and Gas License fiscal systems around the world

- ❑ Tax/Royalty Agreements (Concessions)
- ❑ Production Sharing Agreements / Contracts (PSA/PSCs)
- ❑ Service Agreements / Service Contracts
 - Risk Service Contracts
 - Technical Service Agreements (TSAs)

How is it Performed?...1/2

Through Discounted Cash Flow Analysis

By combining all the inputs in an economic model

Full Cycle

- All investments including sunk cost
- Full cycle measures better the overall investment efficiency

Point Forward

- Just looking at future cash flows
- Most investment decisions are made on point forward basis

Incremental

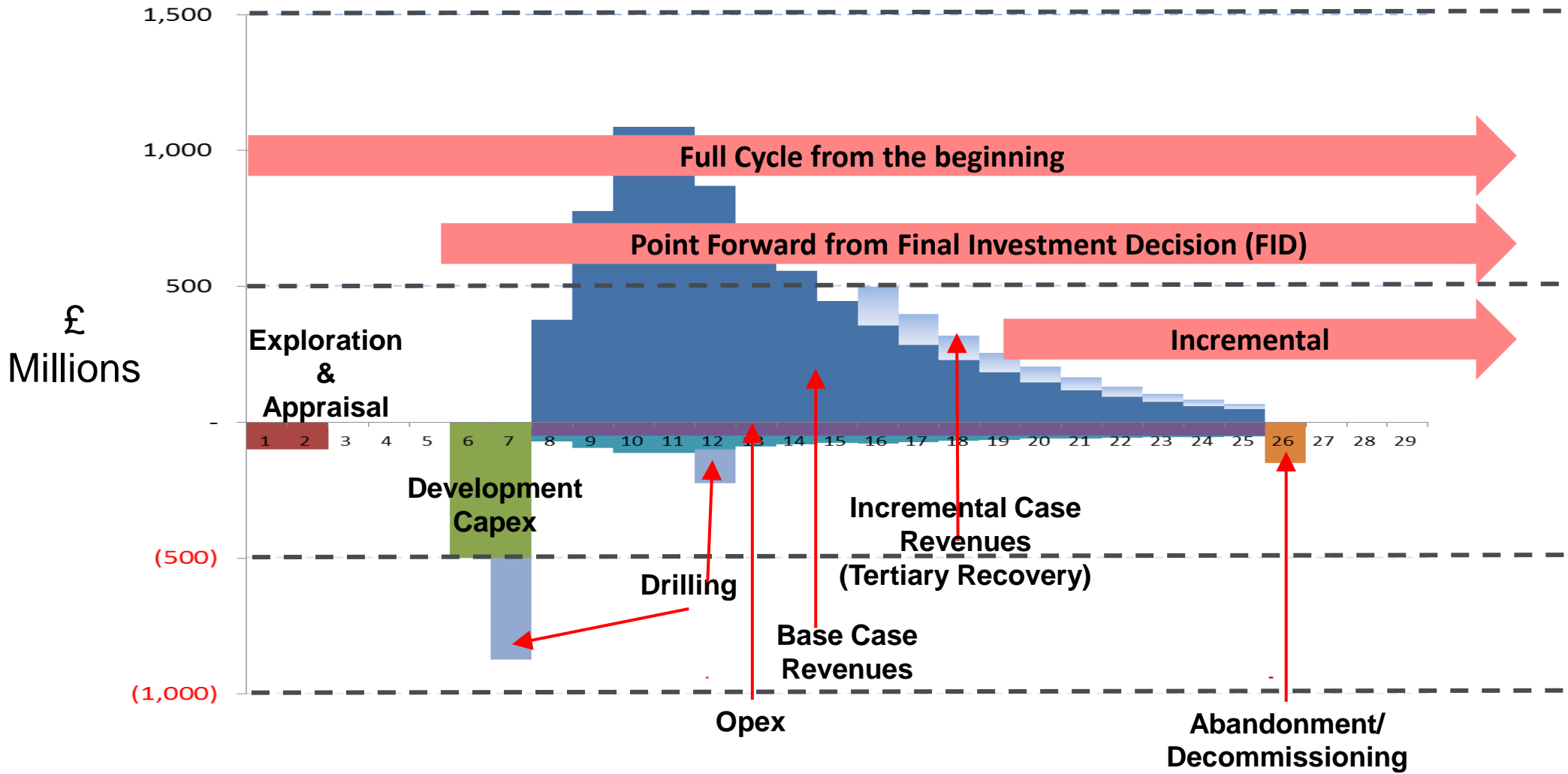
- Sometimes projects cannot be evaluated on a stand-alone basis
- Key reasons include: Tax calculation, Project Timing, Size, part of exiting project

Petroleum Economics can also be done either

- ✓ *Deterministically or Probabilistically*
- ✓ *In Real or Nominal terms*

How is it Performed?...2/2

Full Cycle versus FID Point Forward & Incremental Analysis



Expected Monetary Value (EMV)

Ideal for Exploration & Appraisal Projects

$EMV \neq NPV$

Case NPV

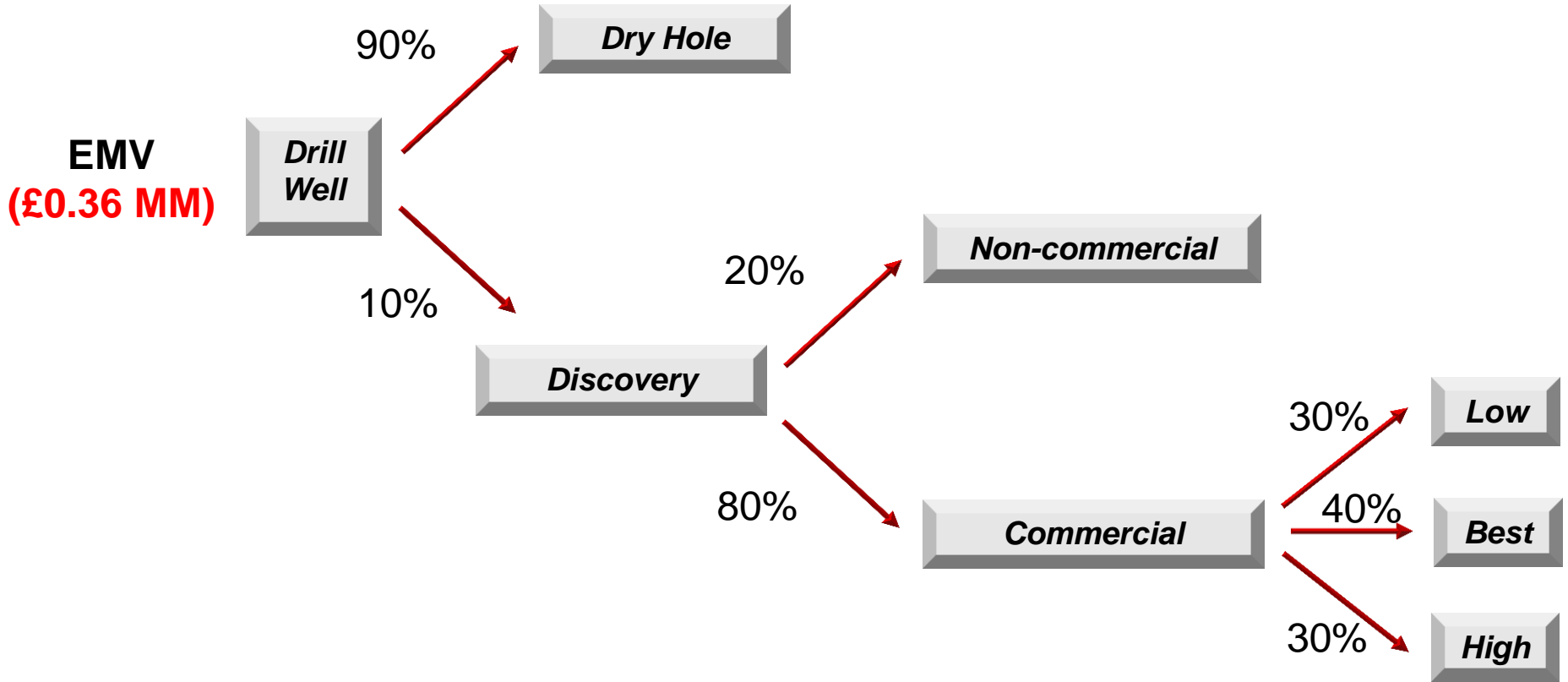
(£5 MM)

(£5 MM)

£10 MM

£50 MM

£100 MM

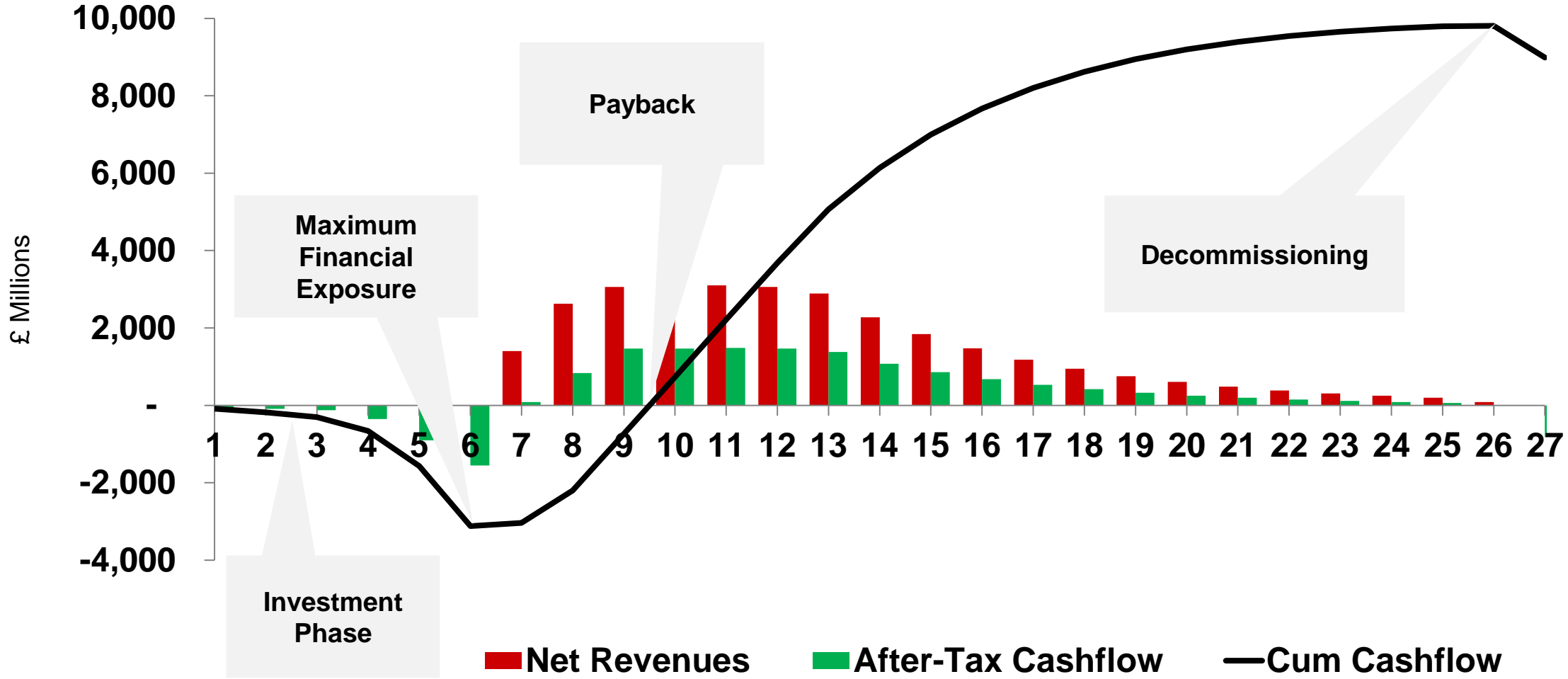


EMV
(£0.36 MM)

Overall Probability of Commercial Discovery = 8%

Whose Cash Flows?

Typical Cash Flow Curve



The Project, The Company, The Lender, The Shareholder?

Jargons Explained

- **Sunk Cost**
 - Costs incurred either before activity started or early exploration costs
- **Full Cycle**
 - All investments are included (Including Sunk costs)
- **Point Forward**
 - Just looking at future cash flows from today till end of field life
- **Standalone**
 - Evaluating a business case for its own merit e.g. – new work program or additional phase of a project
- **Incremental**
 - Just looking at cash flows from additional works. Sometimes projects cannot be evaluated on a standalone basis for tax or not economic on its own
- **Probabilistic**
 - Either applying probabilities to the input cases or to the NPV through Expected Monetary Value (EMV) calculations
- **Deterministic**
 - Using one point case e.g. P50/Mid Case/Best Case/Base case
- **Real/Deflated/Constant**
 - Without inflation
- **Nominal/Inflated/Escalated** (*also know as money of the day*)
 - With inflation applied on all input – Price and Costs

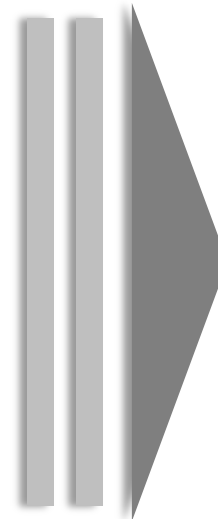
And So What?...1/2

We bother because:

- E&P Decisions & Agreements have to Make Financial & Economical Business Sense
- Useful for Tracking Performance

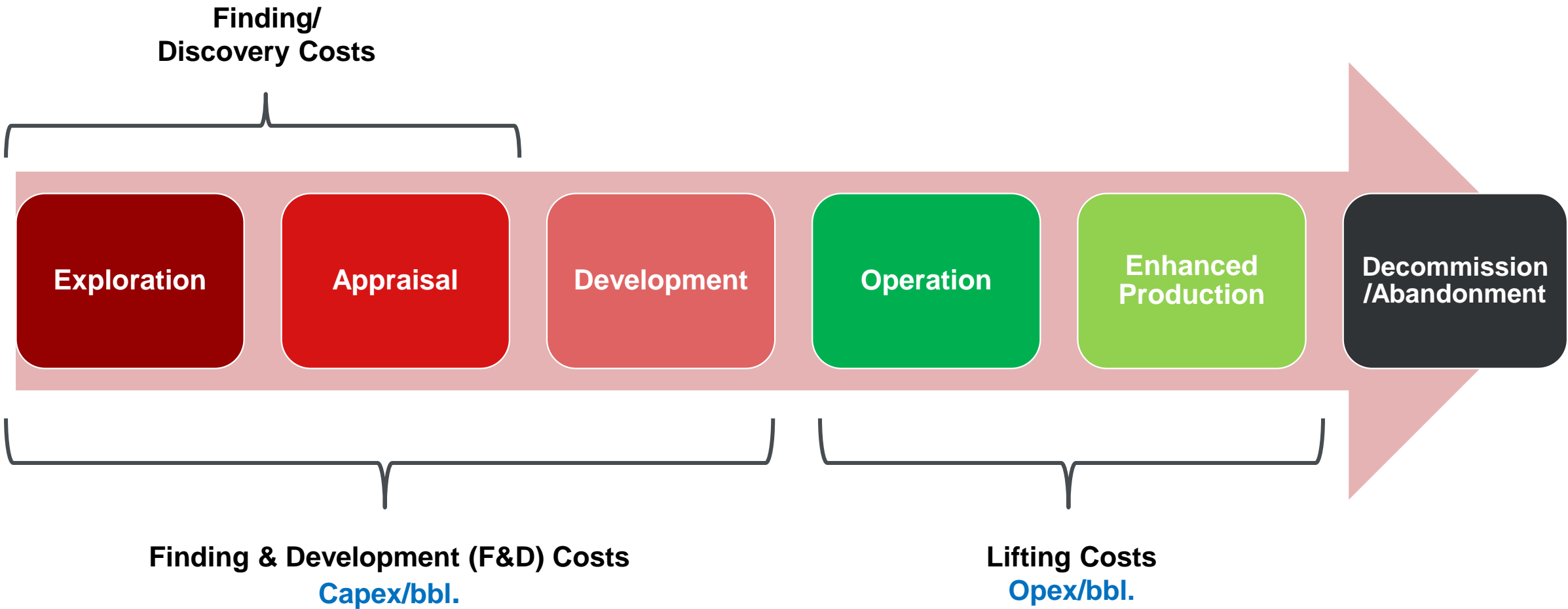
Key Performance Indicators

- Unit Cost/bbl.
- **NPV** = Net Present Value
- **EMV** = Expected Monetary Value
- **IRR** = Internal Rate of Return
- **PIR** = Profit Investment Ratio
- **MFE** = Maximum Financial Exposure
- Payback
- Sensitivity Analysis
- Project Ranking
- Portfolio Analysis



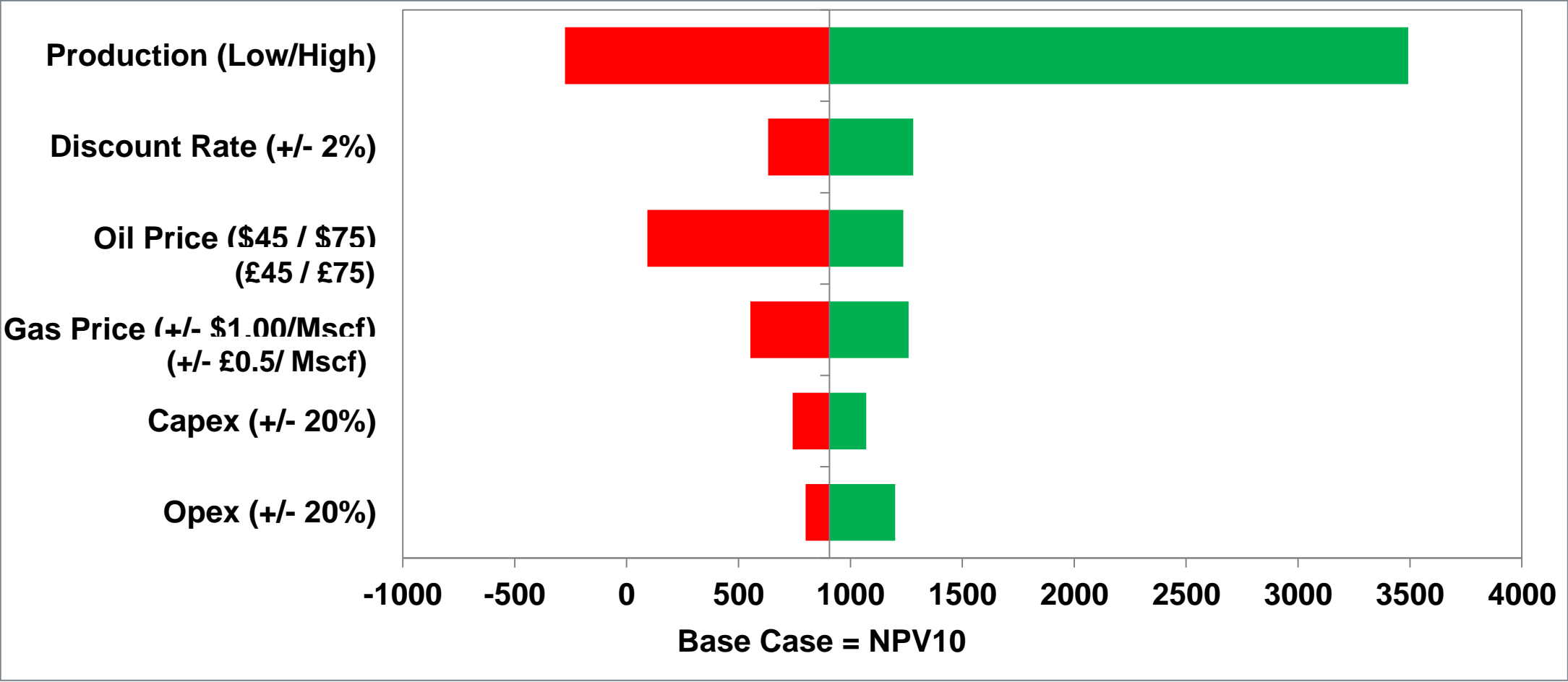
And So What?...2/2

Cost Categories and Unit costs - show efficiency in £/bbl.



Sensitivity Analysis

Example Tornado Chart



All Parameters & Variables should always be stress tested

Useful Checklist

FISCAL & COMMERCIAL

Fiscal Regime/Special Taxes

- Tax/royalty
- Production Sharing Contract
- Risk Service Contract
- Technical Service Contract
- Bonuses
- Petroleum Profit Tax, etc.
- Education Tax/VAT/Import Tax
- Other local taxes

Commercial

- Transportation Agreements (If any)
- Crude Oil Handling (if any)
- Gas Sales Agreements
- Gas Processing (if any)
- Loan Agreement (if any)
- Any special agreement/contracts
- Tariff receipts or payments
- Overriding royalties
- Abandonment Security Agreement

Expiry dates

- License
- Infrastructure lifespan
- FPSO lease

TECHNICAL

Production Profile

- Sales Volume
- Units – Metric/imperial
- Day rates/Annual Volumes

Associated Costs - Real/Nominal & Units

- Exploration and appraisal
 - Geological and geophysical costs
 - Exploration drilling
 - Studies
- Development Capital costs “Capex”
 - Drilling costs:
 - Facilities costs
 - Pipelines
 - Sustaining (replacement) capital costs
- Operating costs: “Opex”
 - Lifting costs
 - Treatment
 - Injection / fuel
 - Transportation
 - General and admin: G&A
- Abandonment/Decommissioning cost

ECONOMIC & OTHER

Appropriate Price Scenario

- Forecast/Constant
- Discount or Premium to reference crude

Real vs. Nominal

- Inflation/Escalation

Discounting/Evaluation Date

- Discount Date
- Discount Rate

Exchange Rate (where applicable)

Depreciation

- Straight Line
- Unit of Payments

Tax Position (at start of evaluation period)

- Capital Allowances (historic Capex)
- Tax Losses (from previous tax years)
- Unrecovered Cost Pool in case of PSCs
- Accumulated Net Cash Flow Balances (in case of PSCs)
- Ring-fences
- Sunk cost

In Summary

- **Why?**
 - » Project Ranking
 - » Concept Selection
 - » Regulatory Requirements
 - » Financing, Monitoring
- **How?**
 - » Economic Modelling
 - » Using Discounted cash flow analysis
- **Project economics can be done on the following basis:**
 - » Deterministic or Probabilistic
 - » Full Cycle or Point Forward
 - » Incremental or Standalone
 - » In real or nominal terms
- **Project economics require the following input data:**
 - » Technical
 - » Economic
 - » Fiscal
 - » Other commercial terms
- **Main Output:**
 - » KPIs like NPV, IRR, MFE, Payback,
 - » Sensitivity analysis



THANK YOU