

Risk & Resource in Oil & Gas

Responsible Raw Materials 2020

Three key takeaways



Full probabilistic reporting of reserves and resources is a thing of great power, elegance and beauty





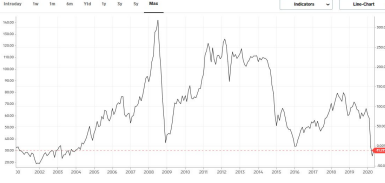


A probabilistic approach enables a **portfolio** view of the progression of resources and reserves

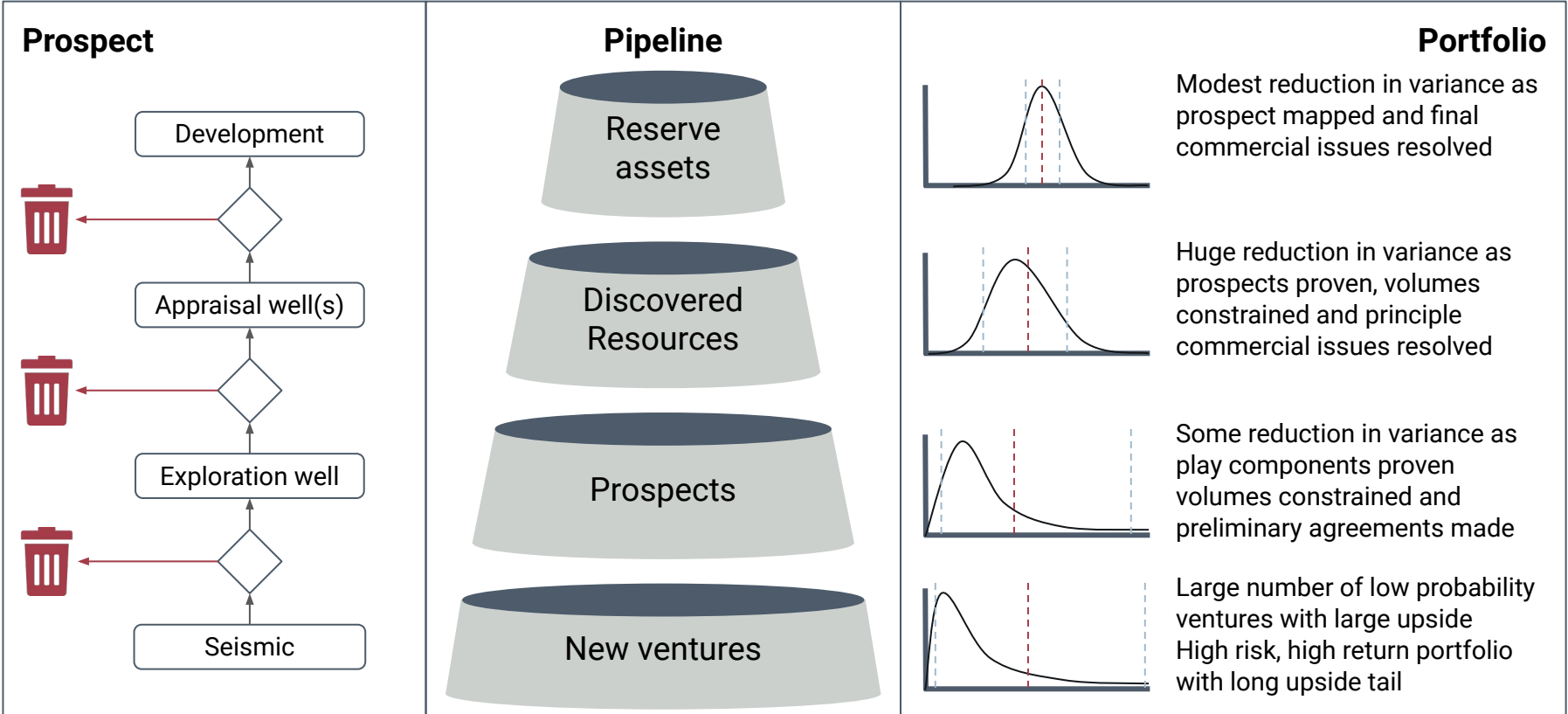


To make this work, ALL uncertainties must be accounted for at all stages in the progression

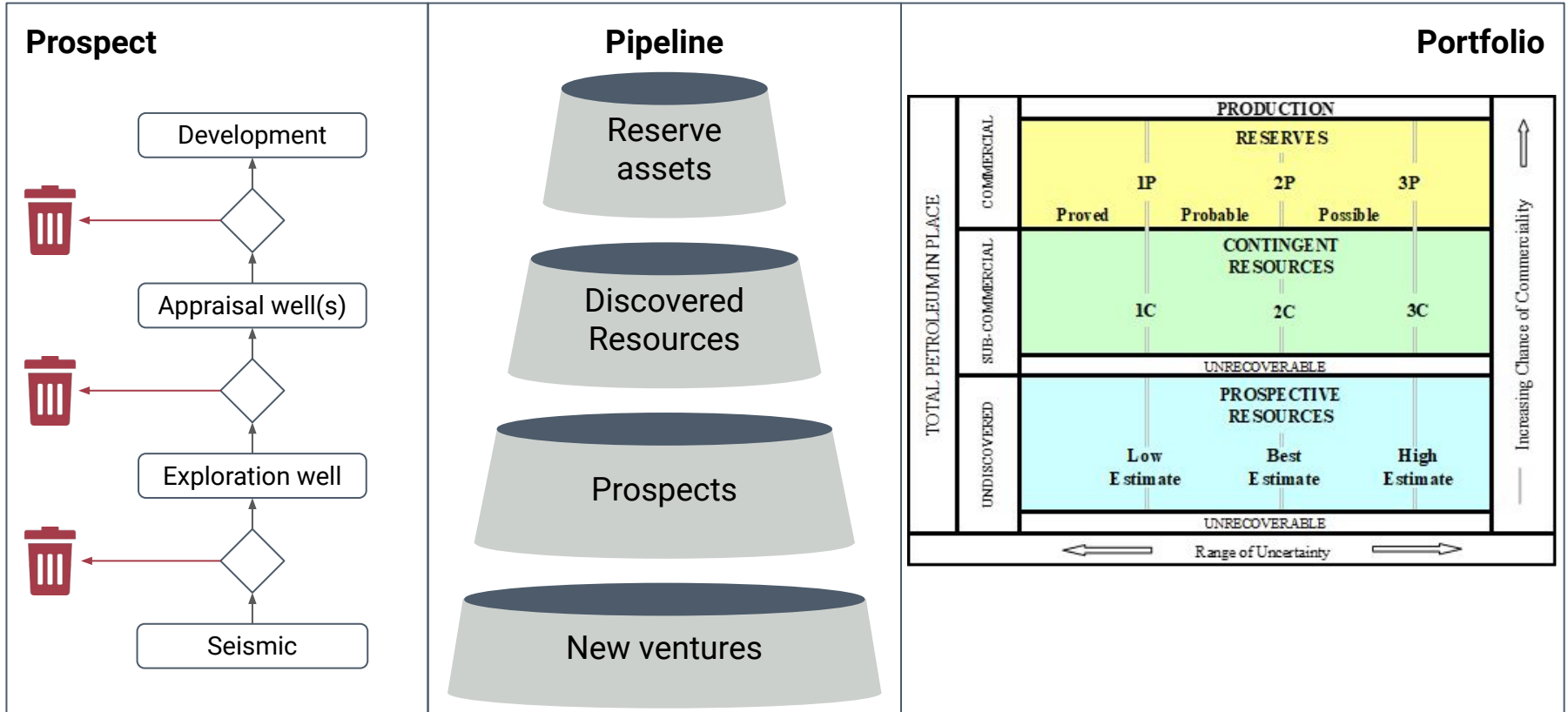
Hydrocarbon resource uncertainties

Subsurface 	Engineering 	Commercial Political & Legal 	Market 
Gross rock volume Column height Reservoir quality Connectivity	Recovery method, Number of wells Facilities, Future technology	Licence to operate, Commercial terms, JV terms, Operating environment, Political environment, CSR	(Forward) oil price Gas prices Contracts
Large uncertainty incrementally resolved Exploration prospect Discovered resource Under development Developed and producing	Modest uncertainty, almost entirely contingent on subsurface Some dependence on concurrent discovery and existing infrastructure	Conditional (Relatively) stable (Relatively) predictable (Relatively) controllable Though some notable exceptions!	Volatile, unpredictable, largely uncontrollable 

Portfolio perspective

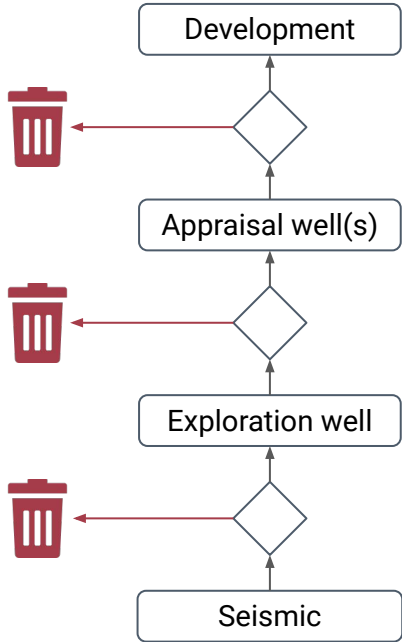


The Society of Petroleum Engineers PRMS

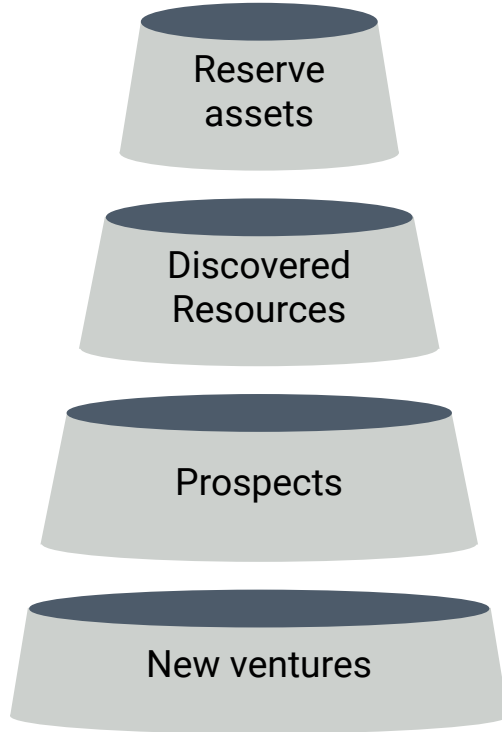


Portfolio perspective

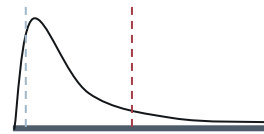
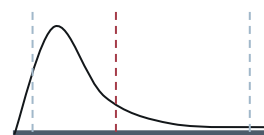
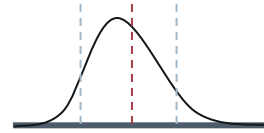
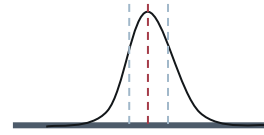
Prospect



Pipeline



Portfolio



- Range narrows despite falling number of prospects
- Reduction in average prospect variance greater than reduction due to portfolio effect
- Mean should not move much
- Loss of prospects countered by high-grading of portfolio
- Only works if all uncertainties are properly accounted at all stages