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Improving E & P Effectiveness

Rose & Associates (R&A) teaches courses, consults and, through our software company, Lognormal Solutions, Inc. (LSi) provides software solutions in the field of quantitative prospect and play analysis.

Our experienced geoscientists and engineers serve our global client base via professional and personal service.

www.roseassoc.com

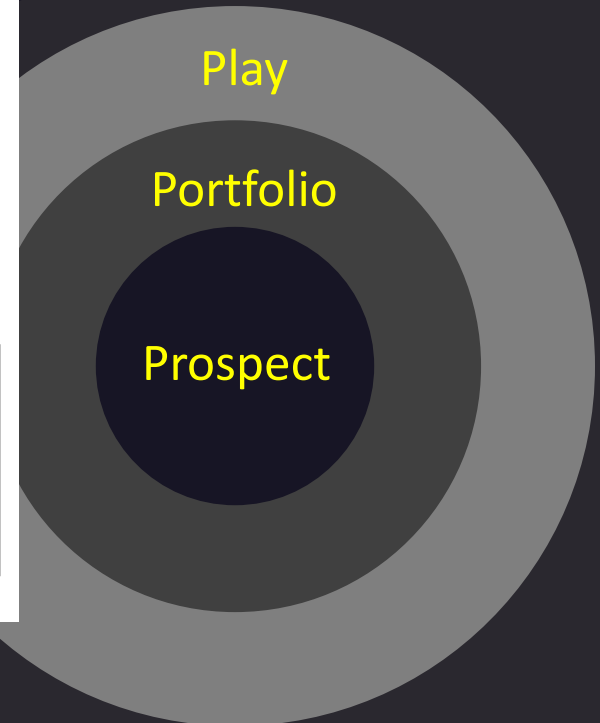
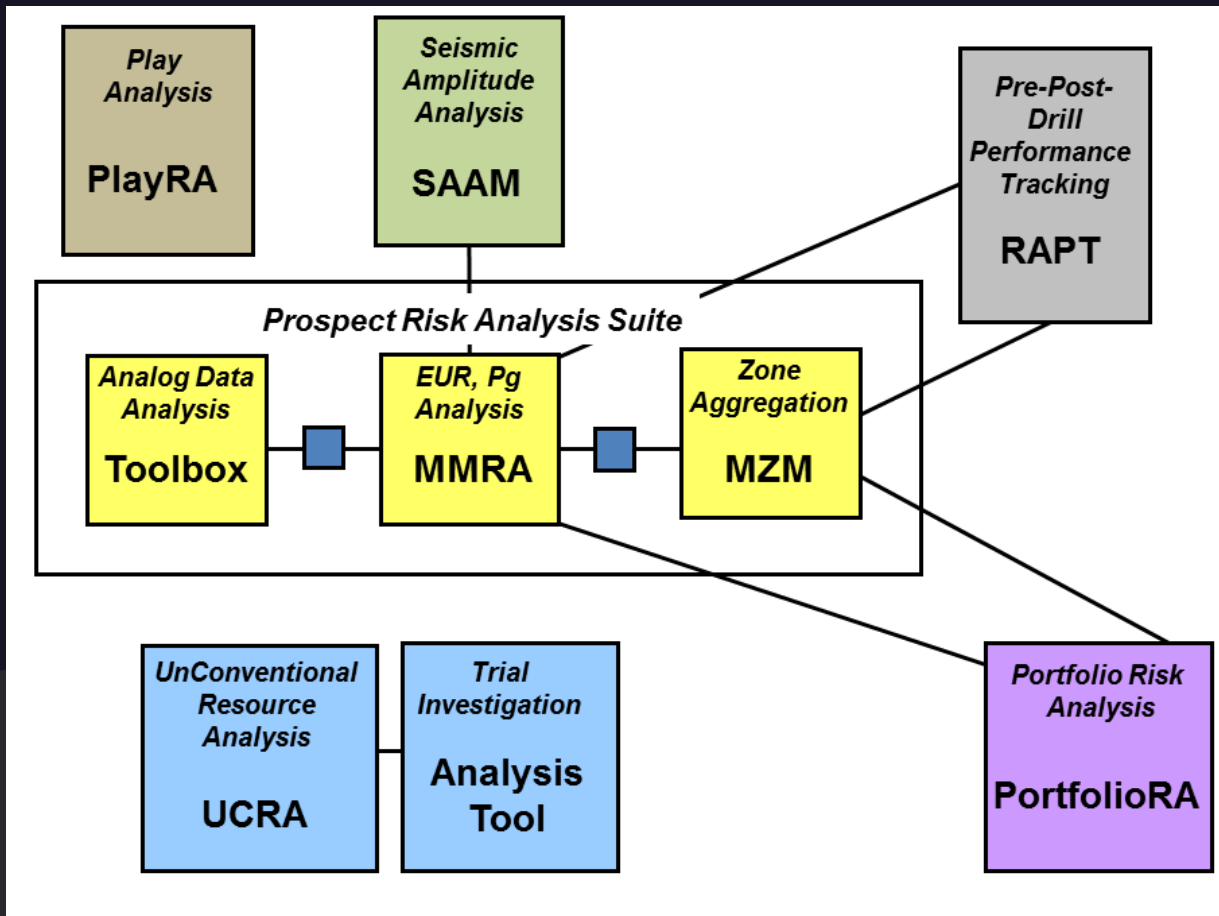


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Prospect Risk Analysis Suite

MMRA, Toolbox & Multi-Zone Master

PortfolioRA

UCRA

PlayRA

SAAM

RAPT



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Prospect Risk Analysis Suite

MMRA

Probabilistic resource estimation via
multiple distribution shapes with
ability to correlate parameters

Multiple methods of resource assessment

area-net pay-recovery yield (RY)

area vs depth; rate-time

rock volume-N/G-RY

scenario aggregation

Chance assessment at the prospect and play level

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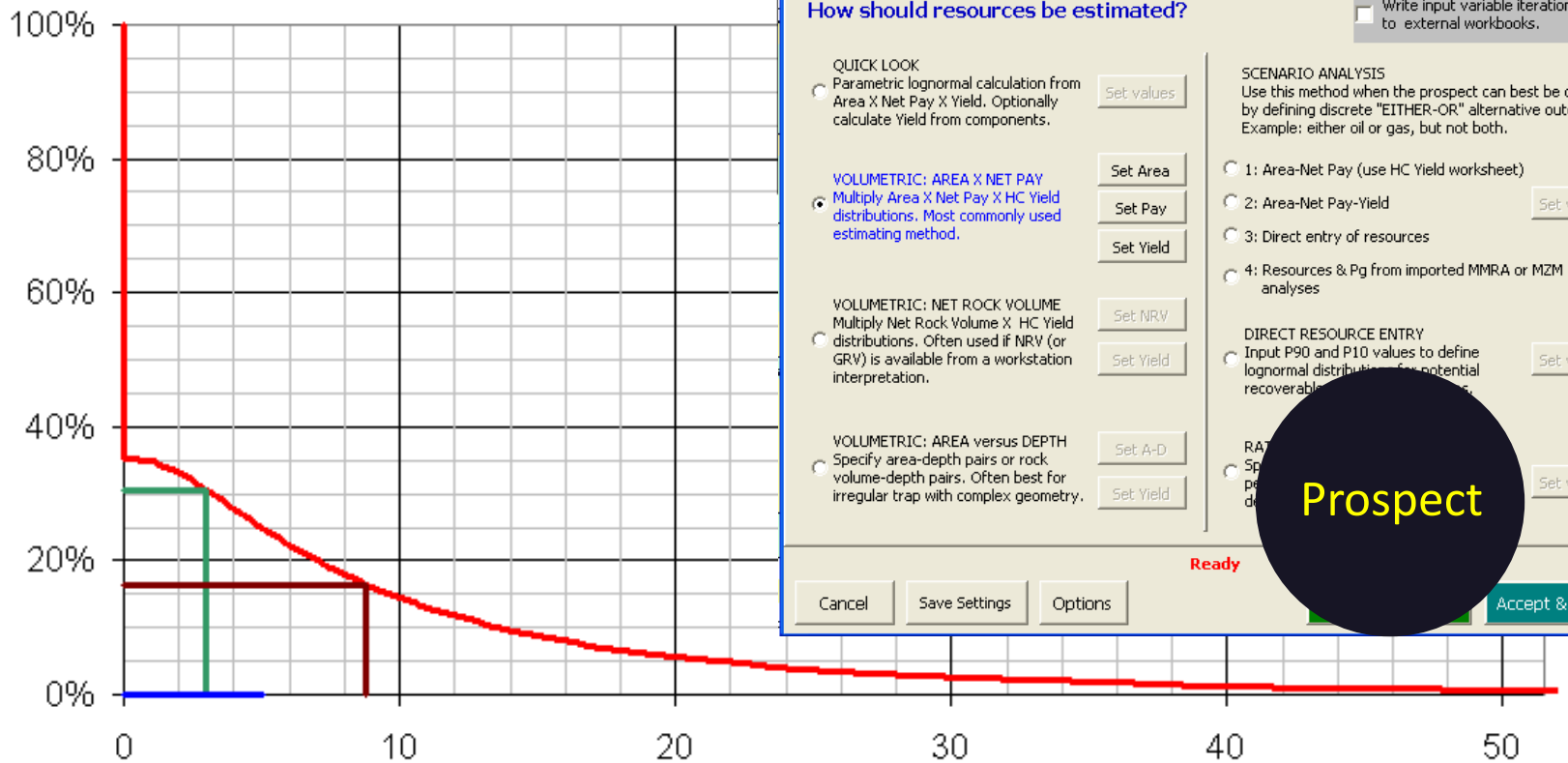
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MMRA



Simulation Options: PROSPECT SETTINGS (shortcut Ctrl-E)

Prospect Settings | Resource Simulation | Notes

Estimating Method | Resource Units

How should resources be estimated?

Write input variable iterations to external workbooks.

QUICK LOOK
Parametric lognormal calculation from Area X Net Pay X Yield. Optionally calculate Yield from components.

VOLUMETRIC: AREA X NET PAY
Multiply Area X Net Pay X HC Yield distributions. Most commonly used estimating method.

VOLUMETRIC: NET ROCK VOLUME
Multiply Net Rock Volume X HC Yield distributions. Often used if NRV (or GRV) is available from a workstation interpretation.

VOLUMETRIC: AREA versus DEPTH
Specify area-depth pairs or rock volume-depth pairs. Often best for irregular trap with complex geometry.

SCENARIO ANALYSIS
Use this method when the prospect can best be described by defining discrete "EITHER-OR" alternative outcomes. Example: either oil or gas, but not both.

1: Area-Net Pay (use HC Yield worksheet)

2: Area-Net Pay-Yield

3: Direct entry of resources

4: Resources & Pg from imported MMRA or MZM analyses

DIRECT RESOURCE ENTRY
Input P90 and P10 values to define lognormal distributions for potential recoverable resources.

RA...
Sp...
pr...
d...

Ready

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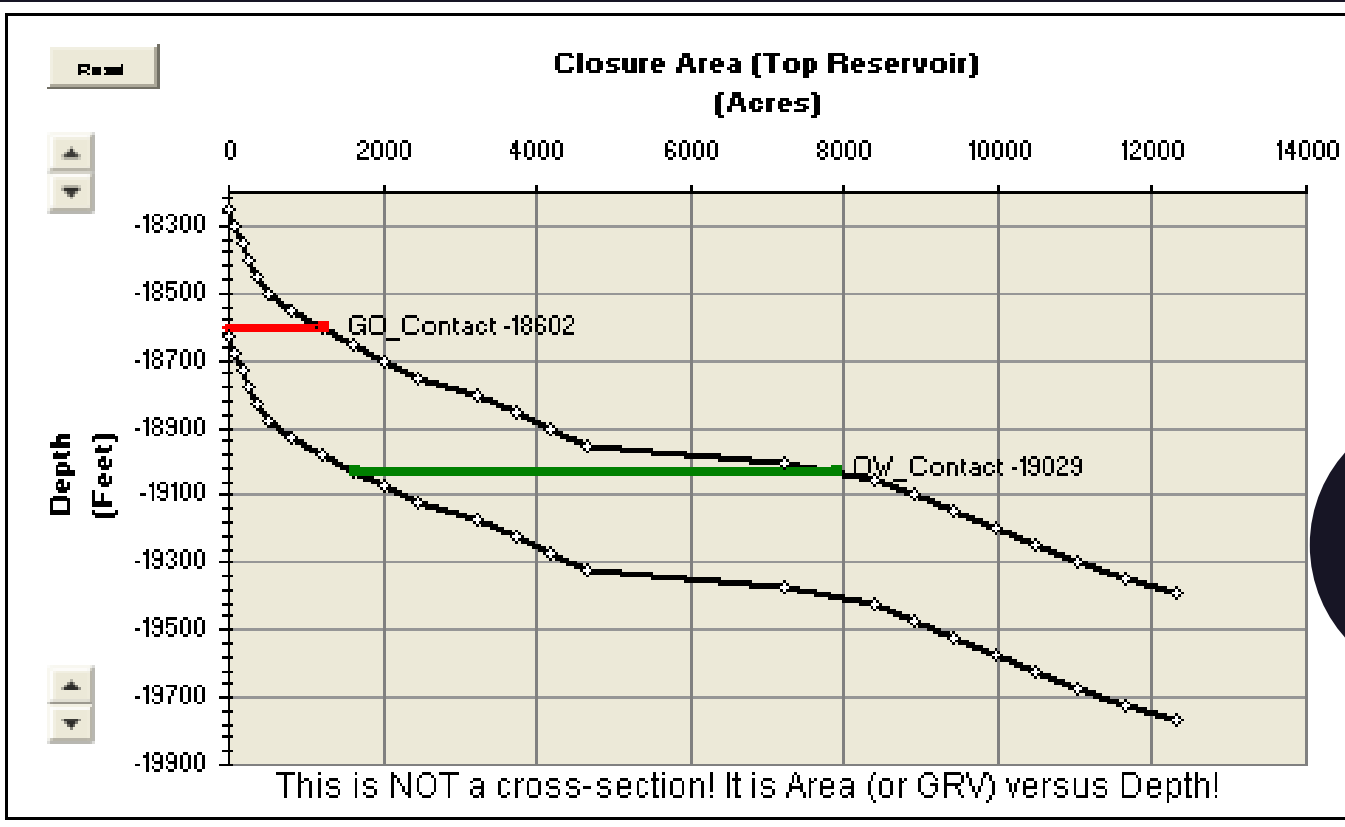
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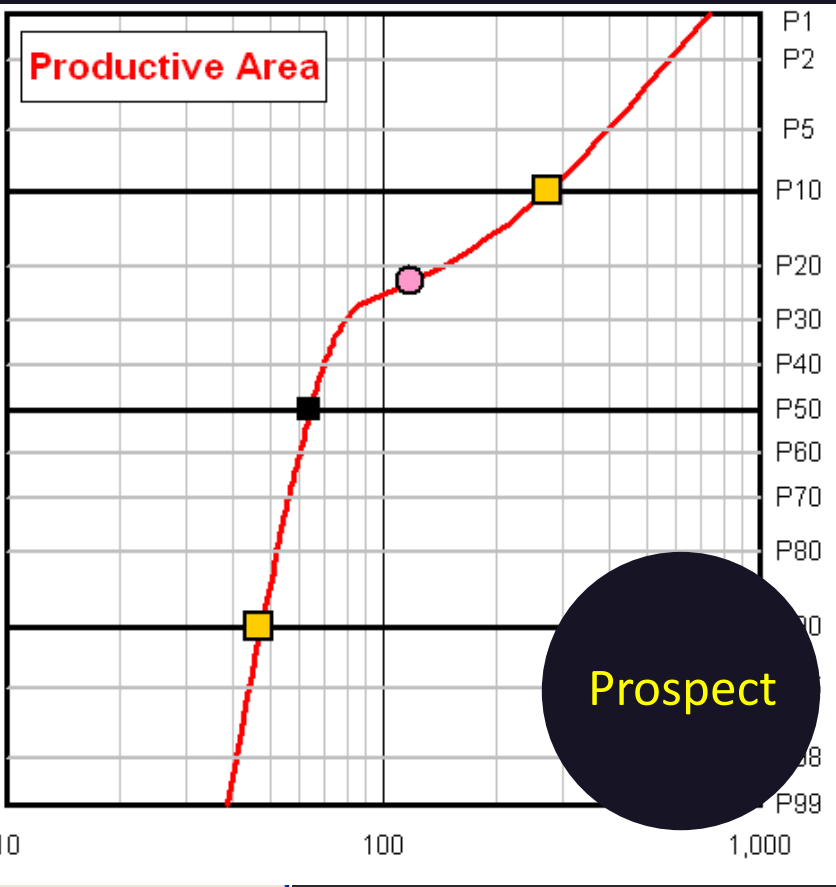
MMRA Scenario-Based Inputs

Scenario-based Interpretation (Area X Net Pay option)

Specify Productive Area and Average Net Pay as untruncated lognormal distributions for each discrete alternative outcome. Area and Net Pay assumed to be INDEPENDENT Scenarios are MUTUALLY-EXCLUSIVE. Corporate Input & Output Truncations, Commercial & Economic Thresholds, and Max Limit are applied on simulation.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Include in simulation?	<input checked="" type="checkbox"/> Include? <input type="button" value="Clear"/>	<input type="checkbox"/> Include? <input type="button" value="Clear"/>	<input checked="" type="checkbox"/> Include? <input type="button" value="Clear"/>	<input checked="" type="checkbox"/> Include?
Relative Weighting	40	100	30	30
Normalized	40.0%	N/A	30.0%	30.0%
Description (Optional)	DHI case - area corresponds to best amplitude. Little area uncertainty.	Alt DHI case - larger area includes more poorly defined amplitudes downdip.	Geological case - little control on area except for regional fill averages.	Alt Geological assumes DH indicator that sand extent remains unce
Productive Area (Acres)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)
	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)
P99-Mean-P1	365 - 449 - 548	N/A	639 - 1899 - 4695	562 - 937
Average Net Pay (Feet)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)
	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)
P99-Mean-P1	14 - 102 - 433	N/A	46 - 129 - 307	28 - 116
Pg (%)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)	Reasonable minimum (P90)
	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)	Reasonable maximum (P10)
Normalized	N/A	N/A	N/A	N/A

Note: Active scenarios above will be sampled as untruncated lognormal distributions using the current Yield estimate, Surface Loss (gas), and product proportion (oil vs. gas). Mean values are untruncated means. Relative Weighting values will be normalized and do not need to sum to a specific total.



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Prospect Risk Analysis Suite

Toolbox

Enhanced plotting of five series each with
up to 10,000 values

Multiple curve fitting and numerical clipping options

Curve fit results exportable to MMRA

Volume change and gas shrinkage calculators

Lognormal distribution comparison

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Prospect Risk Analysis Suite

Multi-Zone Master

Aggregates resources and Pg for up to 5 zones

Flexible ways to model chance dependency
and resource correlations

Zone combinations reported for cash flow modeling

Import / export from MMRA & MZM

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PortfolioRA: aggregation of prospects

Quickly captures prospect details via direct entry or import from MMRA or Multi-Zone Master

Provides ranking on five metrics, color coded by quartile

Numerous cross plots of prospect entries

Quickly incorporates costs, prospect value ranges and variable budget constraints

Aggregates and sorts resources, value and number of discoveries with proprietary Monte Carlo engine

Portfolio

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PortfolioRA: aggregation of prospects

of identifier (REQUIRED)	Key		1st	2nd	3rd	4th	
	Investment	Efficiency	Q	Q	Q	Q	
Number of Active & Inactive Prospects in Database Total=20	Net EMV	NRI Change-	weighted Mean	NRI Upside	Resources	Pc	Custom
Bluebird	7	1	1	1	11	1	
blue porpoise	2	2	3	3	9	2	
blue hawk	6	4	5	5	7	5	
blue albatross	4	13	14	13	14	17	
black cat	3	6	6	10	5	7	
red dog	15	11	12	8	13	14	
blue buzzard	1	17	16	17	6	11	

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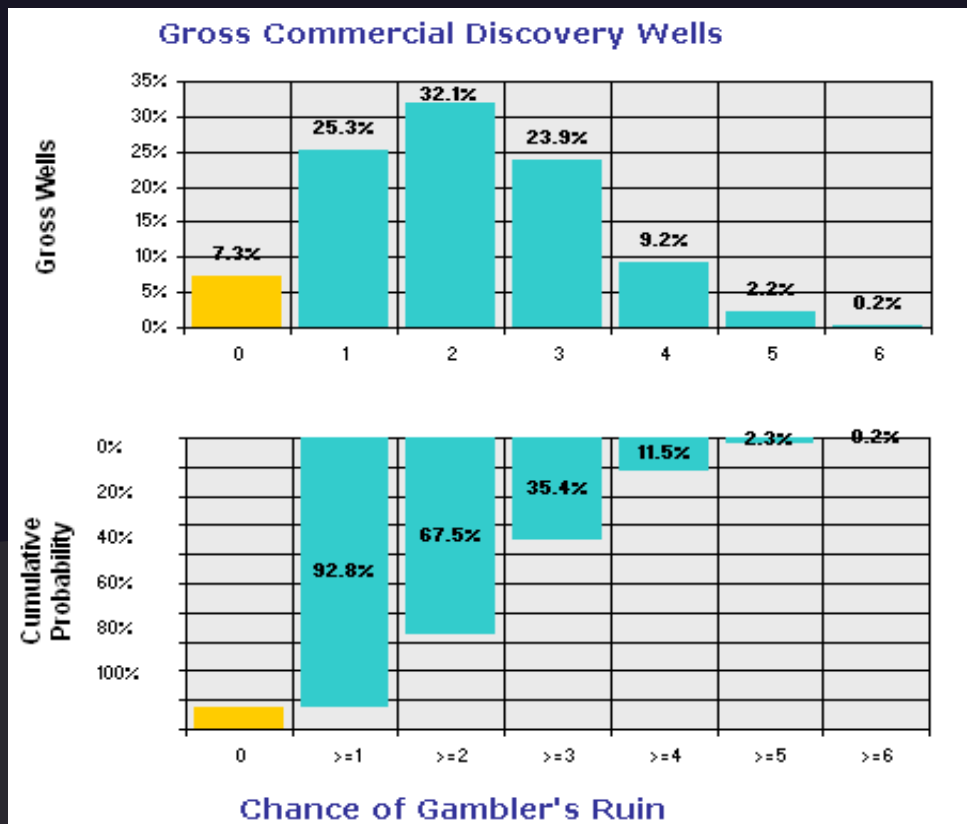
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PortfolioRA: aggregation of prospects



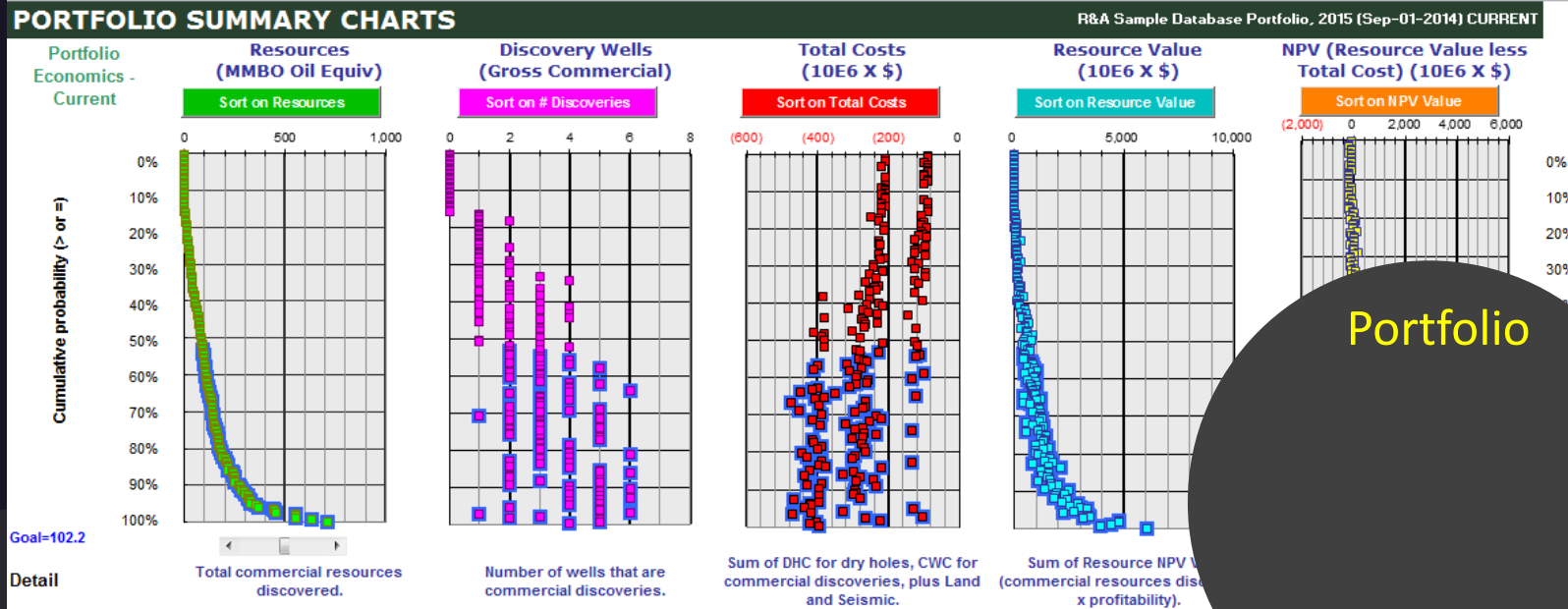
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PortfolioRA: aggregation of prospects

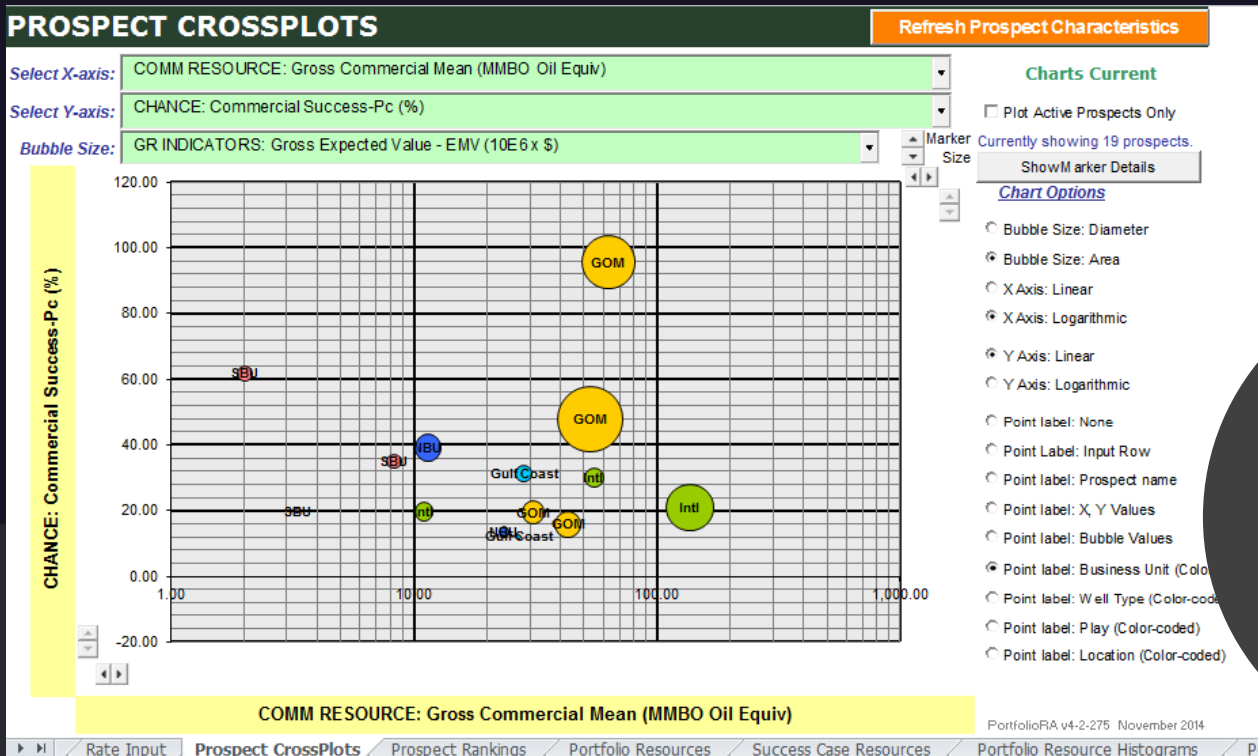


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PortfolioRA: ... and much more: CrossPlots



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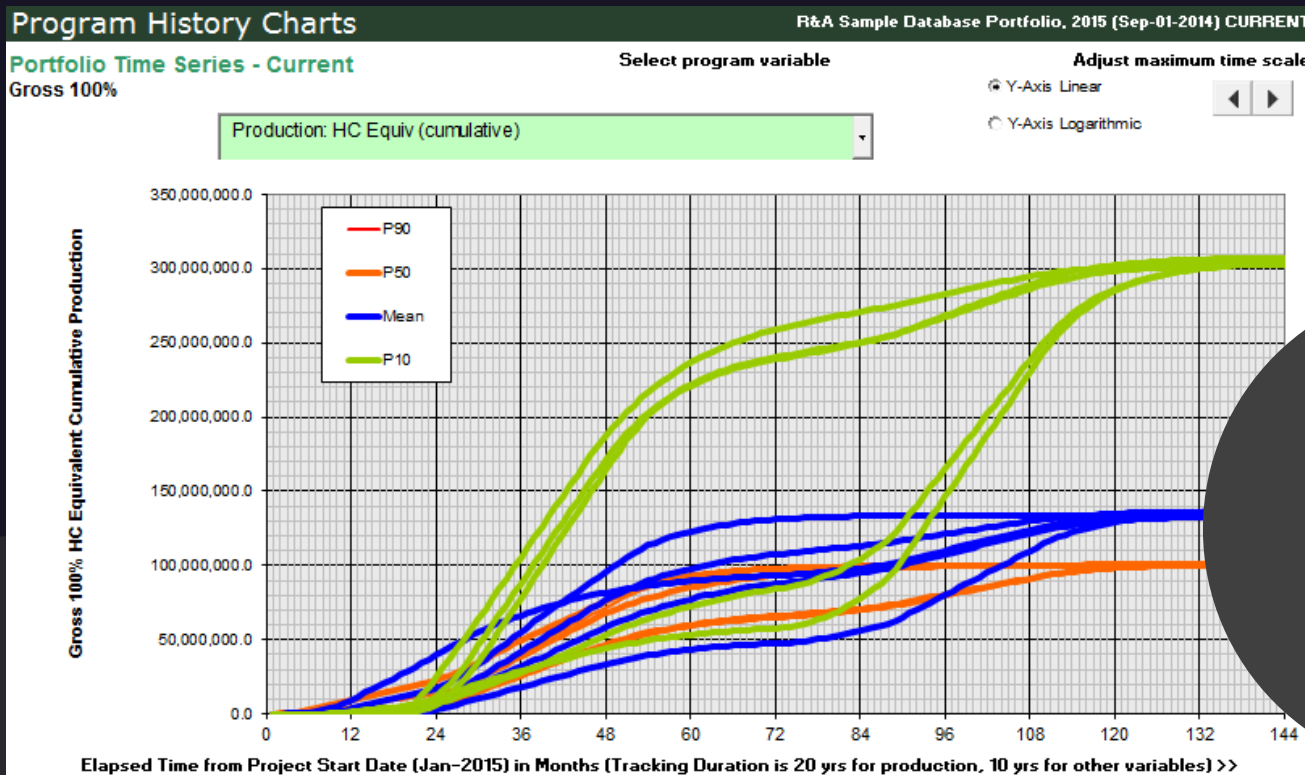
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PortfolioRA: ... and much more: Time Series



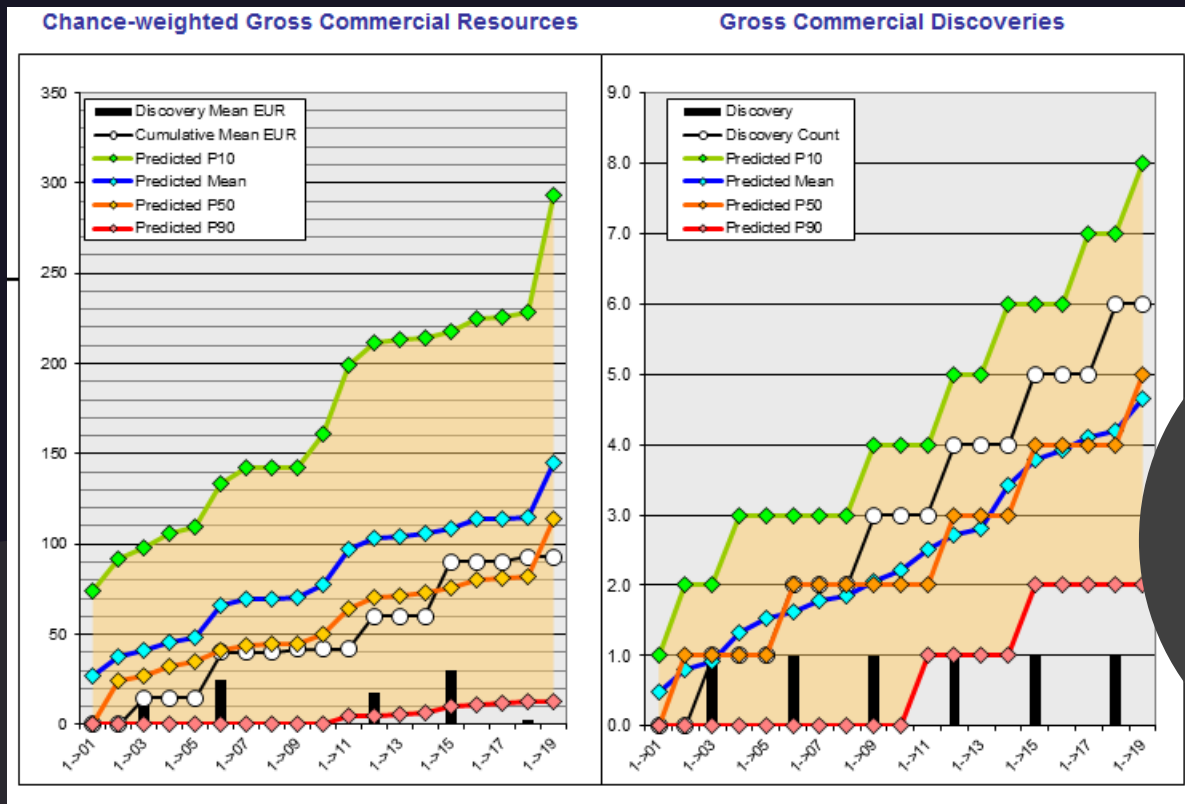
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PortfolioRA: ... and much more: Seq Accumulation



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UCRA: UnConventional Resource Analysis

A fully stochastic cash flow model that incorporates per well resources from type curves and simulates play resources from drilling programs and classical volumetric techniques

Fully customizable chance checklist

Staged investment approach permits flexible definition of the play, pilot(s) and development programs

Incorporates learning curves and timing delays

Models oil, gas and NGL

Comes with its own analysis tool

Portfolio

Play

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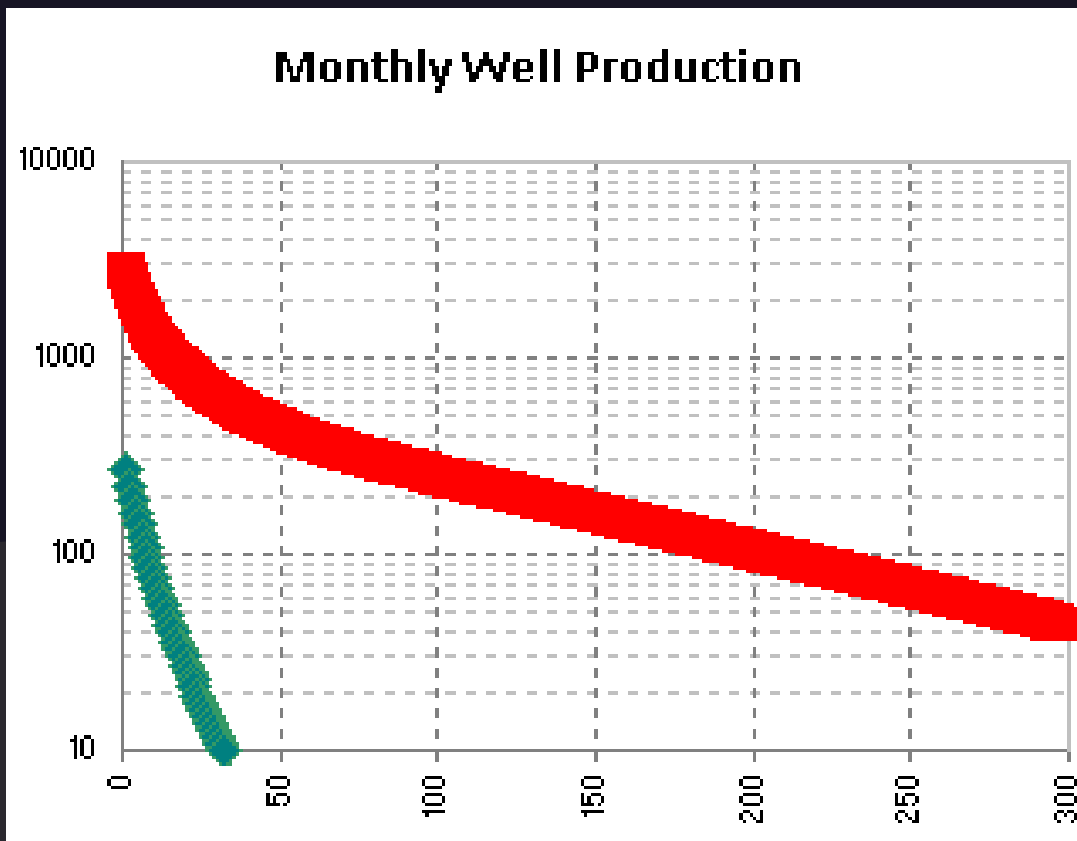
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UCRA: UnConventional Resource Analysis



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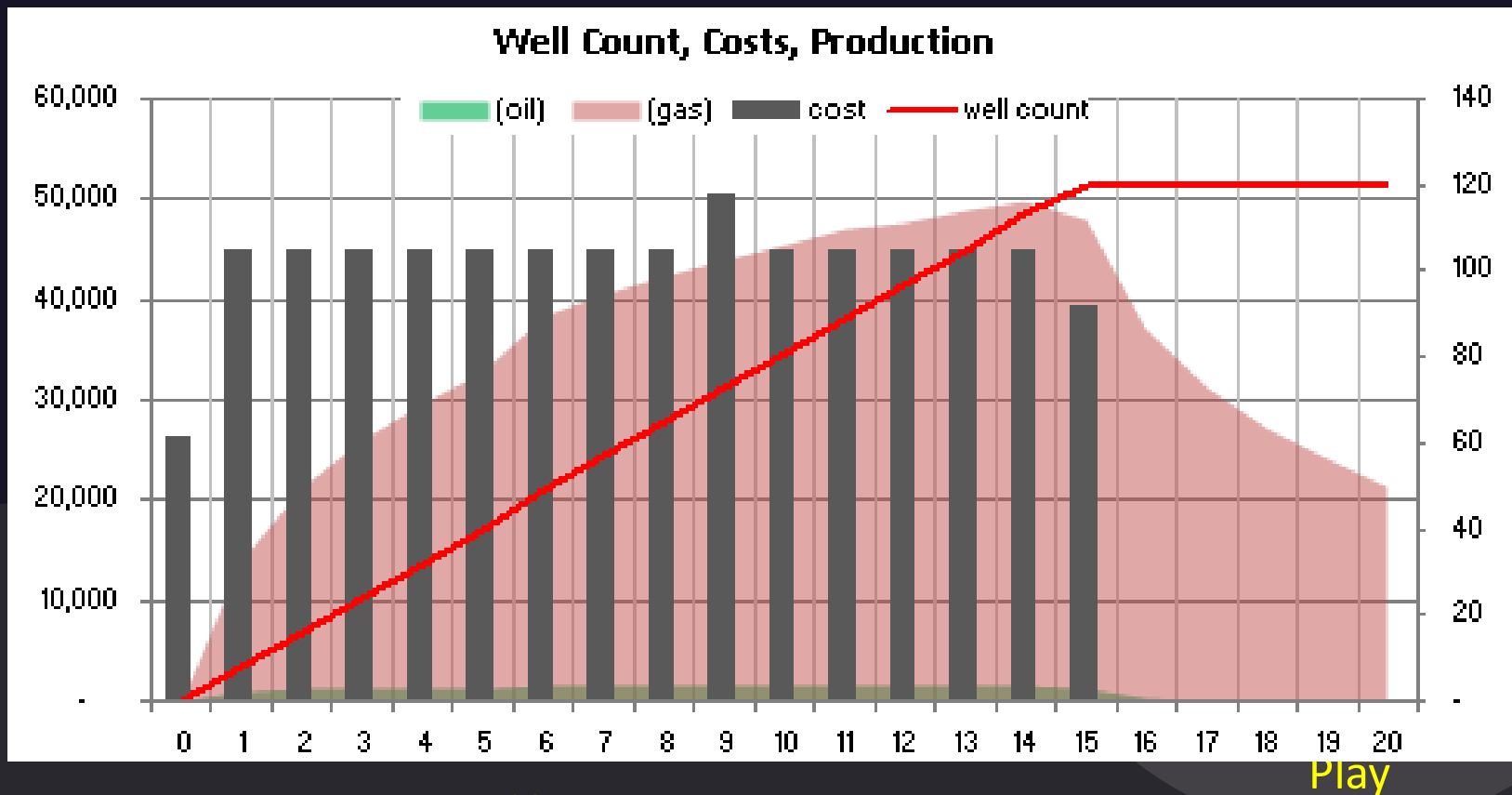
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UCRA: UnConventional Resource Analysis



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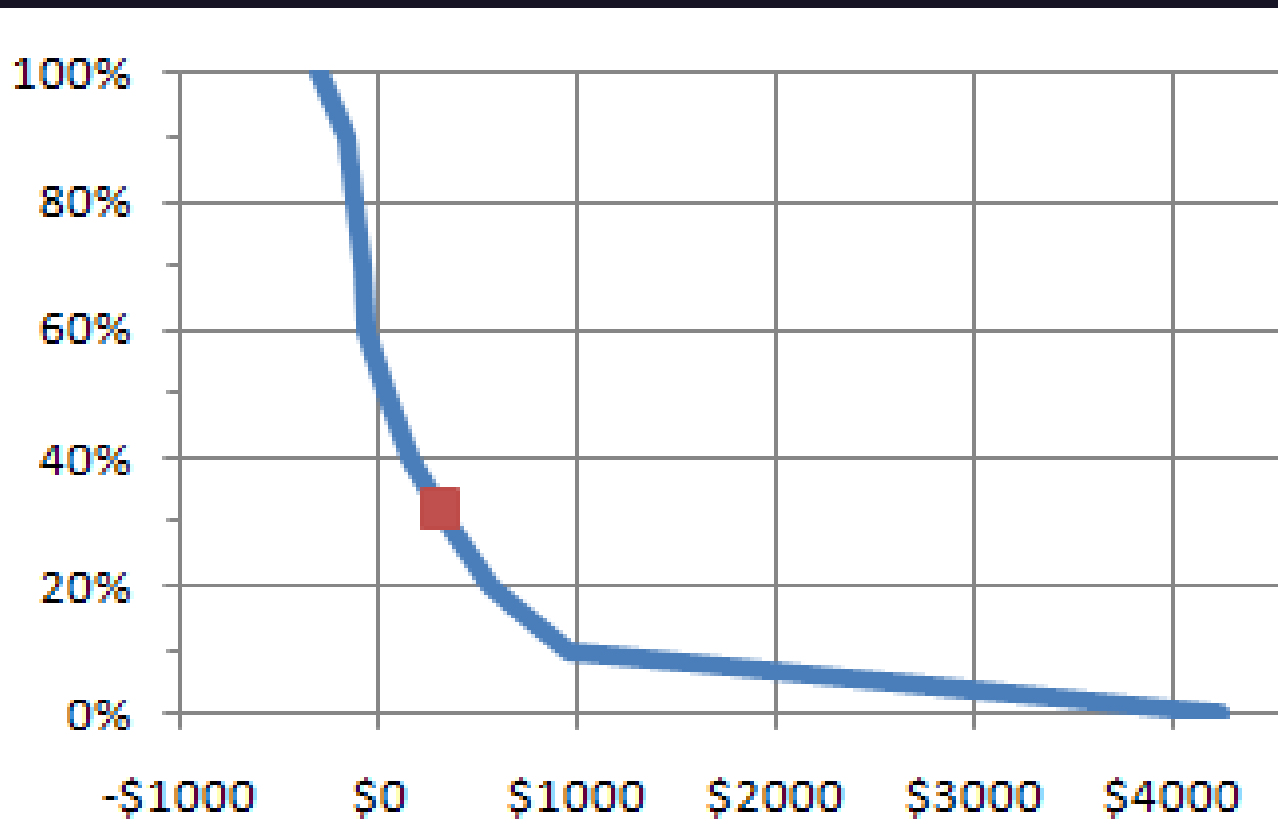
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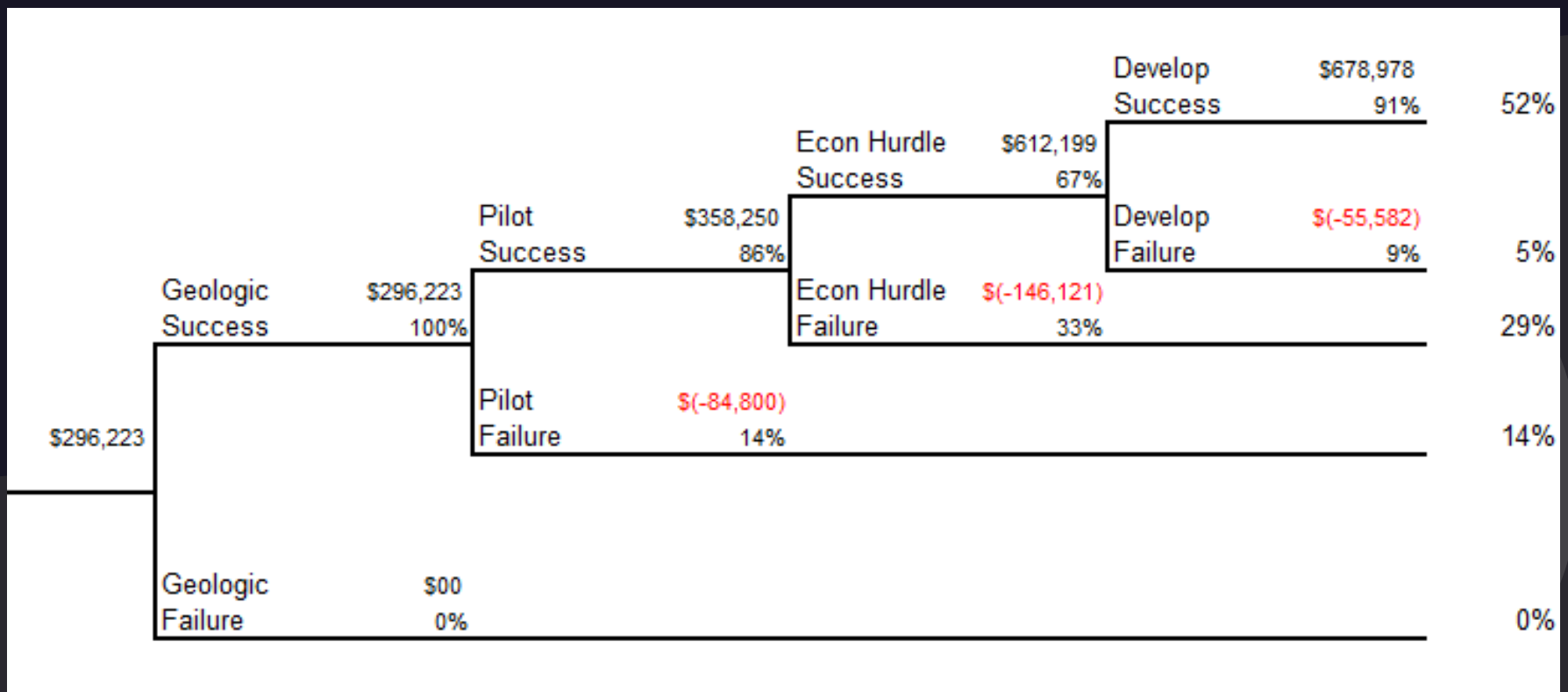
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UCRA: UnConventional Resource Analysis



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PlayRA: Play Assessment

Play Resources from forecast field size or well size
distribution, chance and operational plans

Shared and prospect success rate

Full accounting of well tolerance levels
and staged investments

Input PV/resource distributions that interact with play
resources to determine play value

Extensive reporting and graphing
of success cases and failure cases

Play

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PlayRA: Play Assessment

Chance profiles

DHT & Activity base

FSD & MEFS

DH & SC program costs

Dependencies

NPV per BOE



PlayRA



Economic Resources

Success Case Value

Program Pe

Wells Drilled per Sim

Expected Value

Play Investment Efficiency

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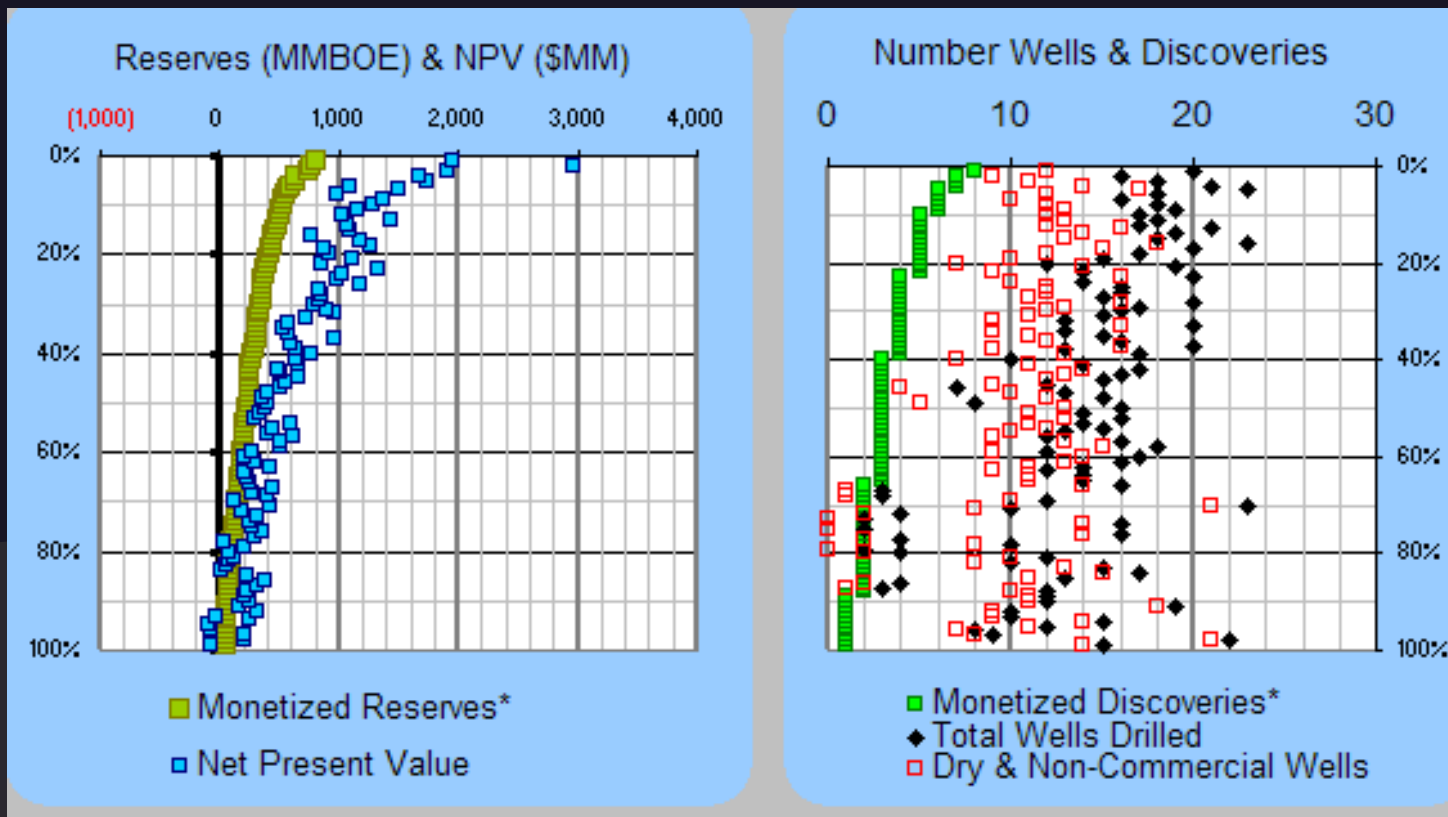
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PlayRA: Play Assessment



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SAAM: Seismic Amplitude Analysis Module

Generated by the DHI Risk Analysis Consortium, ensuring a broad perspective from company experts

Facilitates a systematic and comprehensive grading of amplitude characteristics, associated rock property models and seismic data quality attributes

Prospect

Membership in the DHI Consortium guarantees delivery of the extensive database compiled since 2000 for calibration purposes

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SAAM: Seismic Amplitude Analysis Module

AMPLITUDE ANOMALY CHARACTERISTICS				Bright Angel 18/Dec/01 GOM Shelf Miocene			
<i>Note: please answer all questions in this section.</i>							
Pg Weights		Pay Thickness Weights		Productive Area Weights		<i>Presently using the weight set for: Class 3</i>	
				<ul style="list-style-type: none"> ■ Amplitude ■ Edge effects ■ Rock physics ■ AVO ■ Pitfalls ■ Context ■ Analogs ■ Containment ■ User specified 			
CATEGORY / CHARACTERISTIC		DESCRIPTION	Effect	GRADE	Pg	Pay Thickness	Productive Area
Local change in amplitude	Amplitude change (as viewed on stacked P wave seismic data)	Very strong amplitude change relative to chosen background.	5	10	2	2	
	Consistency within mapped target area	Generally consistent within the mapped target area, but small areas show marked variations.	3	8	0	8	
	Other strong anomalies outside closure (within same stratigraphic sequence)	This amplitude event is unique. No similar events can be seen outside the prospect area	5	10	0	8	
Edge Effects	Downdip conformance (fit to closure)	NOT APPLICABLE - Not scored as either favorable or unfavorable.	0	6	2	10	
	Flat Spots indicating fluid contacts	Possible indication, but might also be caused by stratigraphic changes.	3	7	9	10	
	Frequency/character change at expected HC contact (tuning effects)	Fair freq/character change at expected HC contact	3	7	7	5	



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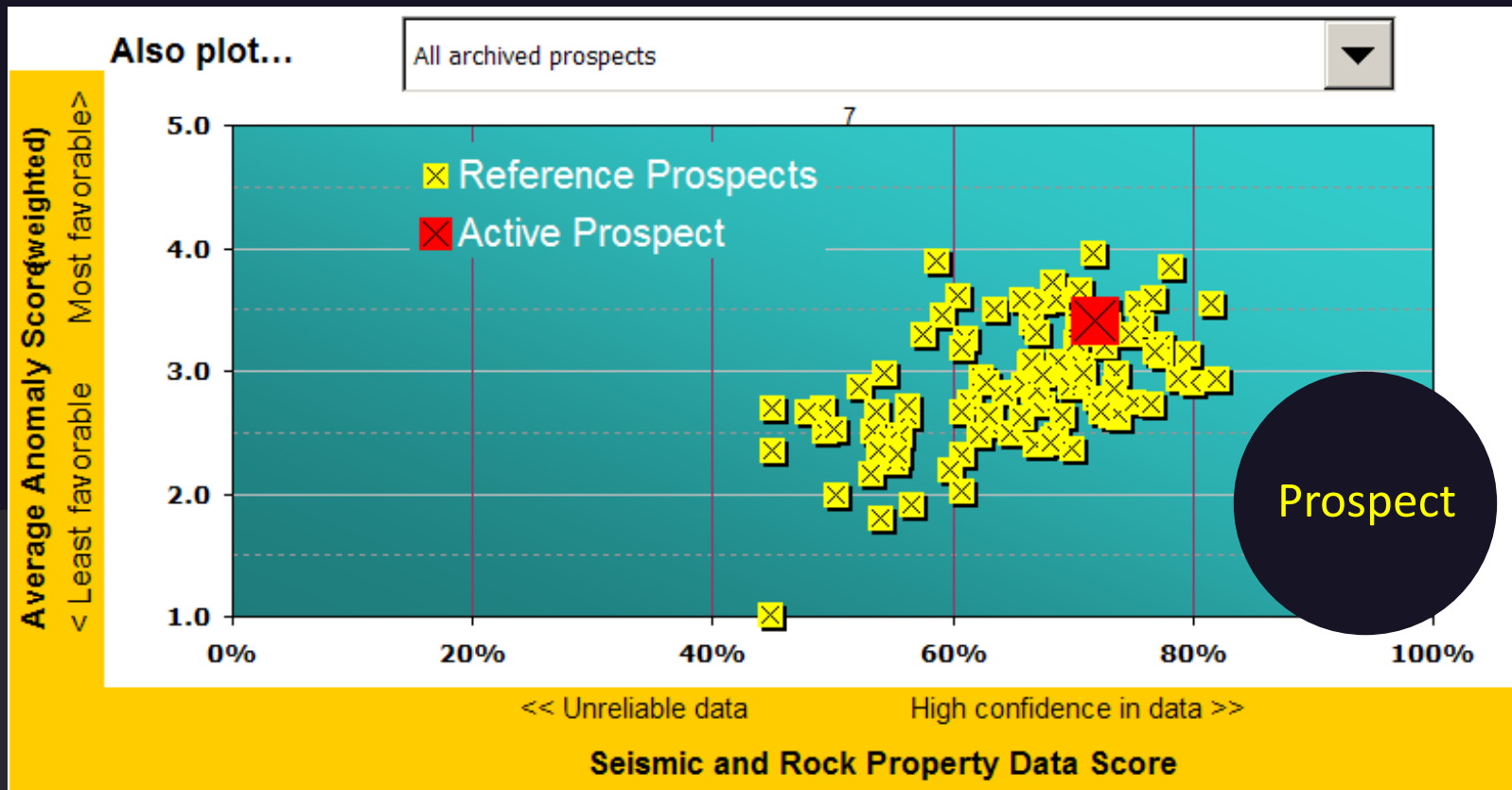
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SAAM: Seismic Amplitude Analysis Module



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RAPT: Risk Analysis Portfolio Tracker

Imports estimates and actual results from MMRA or any spreadsheet with unique adapter

MS SQL Server executable license available on a per seat basis

Multiple filters and graph types

featuring the percentile histogram to sort and analyze bias

Export as needed to Excel for additional reporting flexibility

Learn from your experiences

Portfolio

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