PetroRA's Three Day Course:
**Risk Analysis for the E&P Industry**
We will show that delivering unbiased estimates is a challenge the E&P industry often fails to meet. False precision and too broad a statistical approach are both common problems each involving application of an inadequate degree of technical rigour. We will see that the same issues apply to other areas of human endeavour from the sporting arena to rocket science. We will discuss the cause of this poor performance, the way in which the human mind perceives and integrates information. A series of exercises provides the opportunity for the class to test and improve their estimating skills.

While the assessment of exploration prospects is a focus of the course non volumetric reserve estimation methodologies and assessment of chance from a development perspective are also covered.

The course draws on the foundations established by Ed Capen, Peter Rose and other pioneers but goes beyond that including the lessons learned by industry in a wide range of geological settings and organisations up to the present day. Particular emphasis is placed on the following:

- What inputs (i.e. gross rock volume and net to gross or productive area and average net pay) are best to use in what circumstances
- how to determine what distribution types should be used to represent these inputs (i.e. lognormal, beta or normal)
- the critical importance of a range of attention focussing tools and how to apply these correctly using real examples
- when and how to vary the complexity of the process in order to ensure technical rigor when dealing with issues like:
    - complex traps
    - stacked targets
    - direct fluid indicators
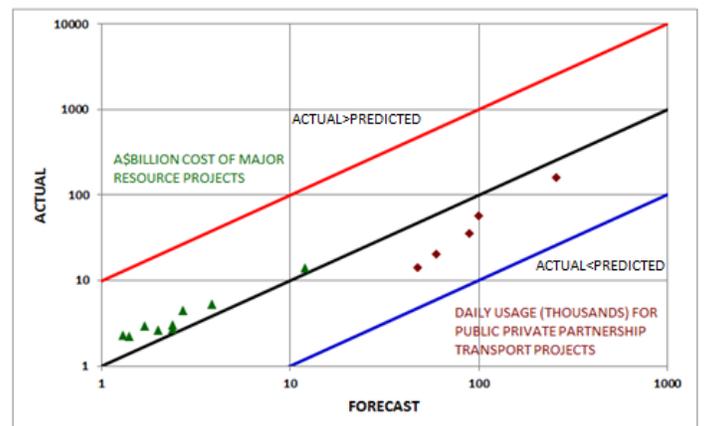   - correlation of input parameters

EXPLORATION PREDICTIVE PERFORMANCE
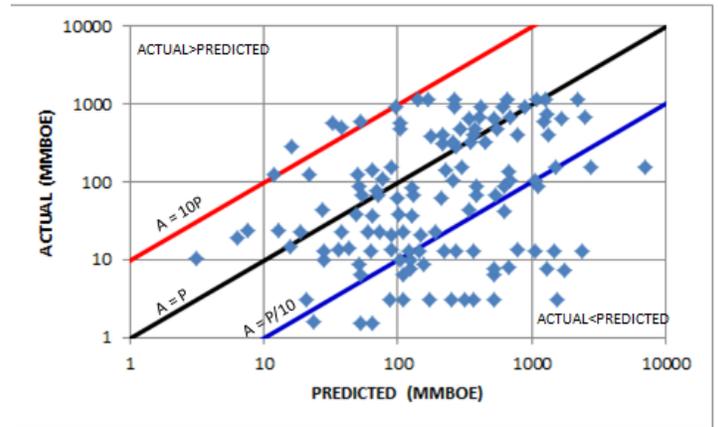
LOWSIDE RESERVES TOO HIGH
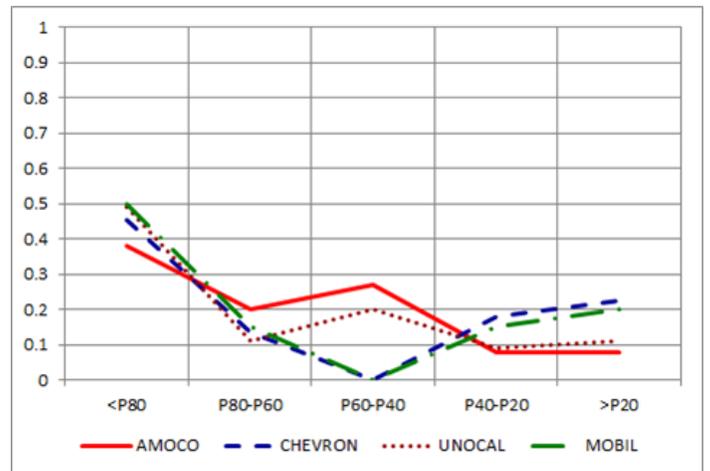
NON E&P EXAMPLES

A critical part of the course will be reviewing real data in order to discuss the application of these steps.

Course Contents
Introduction:
    E&P Industry (exploration and development) estimates poorly
    Evidence this extends to all areas of human endeavour; from rocket scientists to football supporters
    Proof getting it right provides a competitive advantage

Estimating under uncertainty:
    Exercises and review of studies demonstrating our difficulties estimating under uncertainty
    The major types of bias
    How we perceive and process information
    Examples of the incomplete and imperfect datasets available for prospect assessment and implications for the assessment process
    Attention focussing tools which are used to debias estimates:

Reserve estimation:
    Understanding how the major types of bias impact on estimation of reserves
    How to apply attention focussing tools when estimating reserve potential
    Data from exploration prospects to demonstrate principles
Chance estimation:
    Understanding how the major types of bias impact on estimation of chance
    How to apply attention focussing tools to estimation of chance
    Data from exploration prospects to demonstrate principles

Beyond the basics:
    Stacked targets
    Complex traps
    Scenarios
    Dependency and correlation

Review of company prospects

Instructor

Steve McIntyre is a geologist with over 30 years of experience including stints at Esso, Ampolex, Santos and Rose & Associates. He has gained a significant degree of risk analysis experience since providing the analysis which led to the adoption of the probabilistic approach at Santos and Ampolex in the early 90's. He has trained staff and management and undertaken consulting work at more than 40 companies including Shell, Chevron, Saudi Aramco, Encana, PTTEP, CNOOC, Merak, JOGMEC, OMV, Occidental, Kerr McGee, Woodside, Origin and Santos. His experience as a prospect generator, as a team leader for exploration, development and planning teams and involvement in the design, implementation and management of the portfolio management process gives him a wide perspective on the risk analysis process itself and how its output is used beyond the exploration function. In 2007 he left Rose & Associates and started his own company, PetroRA, providing training and consulting support to the E&P industry.

WHERE A DFI IS PRESENT

ADEQUACY MATRIX

For each of reservoir, closure, charge and seal

IMPACT OF METHODOLOGY