

# BIAS AND UNCERTAINTY MAKING GOOD DECISIONS UNDER SUBSURFACE UNCERTAINTY

*Jim Gouveia & Marc Bond*

*Rose Subsurface Assessment*

## Summary

### Outline

- Definition of Problem
  - How, when and why these cognitive errors impact our decisions
- Industry Evidence to Support Hypothesis
  - Impact upon the E&P Industry leading to poor outcomes
- Cognitive Bias
  - Contribution to our poor assessment of uncertainty

Question to Consider:

**How do you make decisions, judgments and interpretations when faced with a bewildering array of choices, data, alternatives and incomplete information?**

3

Investors, and consequently our E&P senior Leadership have exhibited a reluctance to accept uncertainty in their decision making. Our observation is a universal tendency to underestimate uncertainty. This happens because in our world view people are:

- Too sure of themselves and judgements.
- Too attached to their analysis.
- Too certain they have narrowed the range of possible outcomes.
- Not open to considering contrary information and opinions.
- Victims of the Dunning-Kruger Effect.

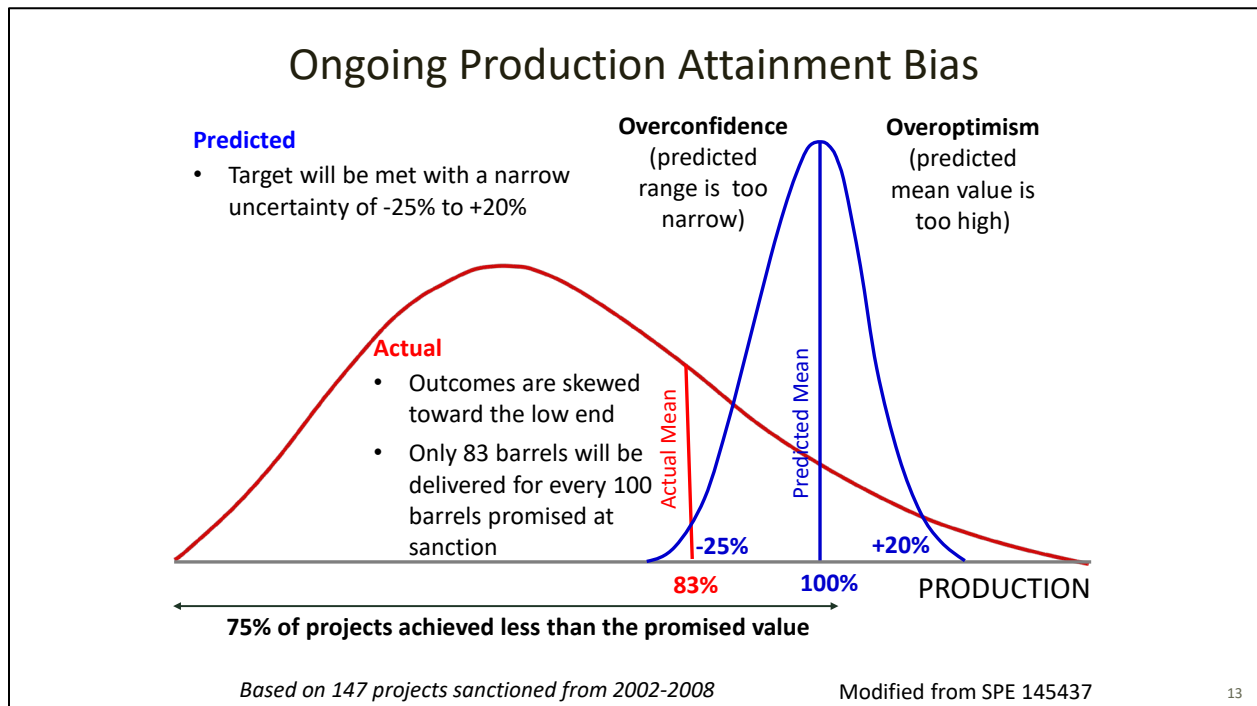
What is the relevance to the E&P industry?

E&P projects have multiple and varied challenges. Can you think of another industry where they drill the equivalent to a \$250 MM exploration well in an unproven basin offshore, for example offshore Newfoundland, with less than a 50% chance of Geologic success? Pharmaceuticals come to mind, but their innovation comes with a guaranteed exclusivity for a number of years and a promise of great riches.

Our projects are fraught with high complexity and uncertainty. We have large amounts of money at risk and competitive forces drive us to make decisions with limited data and unforgiving quick timelines. Subsequently we take shortcuts to act quickly. We meet this challenge by applying intuition, emotion, and experience. Unsurprisingly, many of our Projects fail realize their predicted outcomes. More telling is our collective reluctance to share learnings from our failures. As a direct result we as an industry continue to make the same mistakes over and over again, which Albert Einstein conveniently decided to use as his definition of insanity.

Failing to meet the production targets of our major projects is an ongoing issue. As an industry we succumb to the desire of the investment community to have narrow ranges in our predicted outcomes. Honestly, who wouldn't prefer to invest in a high return opportunity with little to no uncertainty? No one likes uncertainty, but it is a reality of our subsurface and commodity pricing world. Rather than try to mask or otherwise ignore this reality we should strive to collectively embrace rather than ignore or bury our projects uncertainty.

As illustrated in the slide below, our industry's track record demonstrates that we prefer to forecast with narrow ranges, that is, ignore the realities of our project's uncertainties. Our results speak to the underlying uncertainties in our Projects both pre and post drilling, as an example.



As Daniel Kahneman advised we can think of our brains as having a Reflexive “Thinking Fast” and Reflective “Thinking Slow” side.

What we often observe, due to ultra-competitive nature of our industry, is that we lead with the “Reflexive” side of brain. This side relies heavily on instinct, intuition, emotion, and often unconscious and automatic behavior.

In Reflective thinking we use our controlled and conscious reasoning. This often invokes critical, deductive, rational, and logical thinking which is less prone to bias. The downside is that Reflective thinking requires deliberate effort and time and frankly can be draining on us.

So, what’s going on? Bias.

## Cognitive Bias

- Cognitive Bias
  - A predictable, consistent and repeatable mental error in thinking and processing of information that can lead to illogical judgments or decisions
    - Separate concept from a specific mistake
    - Cannot unequivocally ascribe bias to a poor decision
    - Can be made consciously or unconsciously
    - Often occur when heuristics lead to incorrect results
    - Common in all humans, with an evolutionary basis
    - Awareness alone does not mitigate their influence
    - Related, but different, to Motivational Bias

[http://en.wikipedia.org/wiki/List\\_of\\_cognitive\\_biases](http://en.wikipedia.org/wiki/List_of_cognitive_biases)

22

Based on feedback from Rose’s “Mitigating Bias, Illusion and Blindness in E&P Decision Making” course the most commonly reported biases that we encounter in our industry are:

#1	Anchoring	- 77%
#2	Motivational	- 48%
#3	Confirmation	- 44%
#4	Overconfidence	- 44%

Here are some thoughts on ways to mitigate these Bias:

Anchoring – work with multiple or counter “anchors”.

Confirmation – engage in “disconfirmation” bias; try to falsify your model.

Information – become familiar with statistics and probability.  
Overconfidence – widen your ranges – how much? A lot!  
Motivational – focus on the evaluation and decision-making process.

Some Bias mitigation tools you should have in your “Toolkit”:

- Embrace Uncertainty.
- Be aware of bias in yourself and others.
- Require estimates to have a range of outcomes and a level of confidence.
- Undertake a Bias ‘pre-mortem’ and consider what could go wrong and why.
- Encourage questions and be open to discussions – listen!
- Seek independent guidance – we call this Assurance.
- Use Performance Tracking to better calibrate estimations and decisions.
- Consider alternative scenarios and interpretations, employing multiple working hypotheses.

## **Acknowledgements**

This presentation builds on the original works of our dearly departed Dr. Peter Rose, and all of my coworkers at Rose Subsurface Assessment, with a special ‘shout out’ to Marc Bond who developed the original version of this talk and Daniel Kahneman for his decades of leadership in this field.

## **References**

Daniel Kahneman, “Thinking Fast and Slow” and “Noise.”  
Rose course entitled “Mitigating Bias, Blindness and Illusion in E&P Decision Making.”