Economic Evaluation in Petroleum Fiscal Design
The K.I.S.S. Principle

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Learnings from the Front Lines

- Two Decades Plus with Big Oil
  - License Bids, Field Development, Pipelines, Processing, LNG, Power
- One Decade advising Governments and NOCs on Fiscal Policy
  - Legislation, Regulation, License Rounds, Taxation, Contract Design
  - Middle East, Asia, Europe, Latin America
  - Designed and Run Data and Licensing Rounds
- 6 Years with Major Oil Field Service Company
  - “Skin in the Game” Deals
- Stories/Observations based on experience from the three main perspectives of the Upstream E&P Business

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Project Investment Evaluation Methodologies

Stermole: Economic Evaluation and Investment Decision Methods

- **Deterministic**
- **Probabilistic**
- **Stochastic**
- **Monte Carlo**
- **Outcome Distributions**
- **Tornado Diagrams**
- **Spider diagrams**
- **Charts**
- **Plots**

Computers/spreadsheets have allowed the application of many sophisticated tools to improve decision making – but sometimes a more simple, basic approach can be more informative

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Our Case Study – Alaska Tax Design for Gas Production

- In 2007 Alaska passed the ACES petroleum tax
  - Tax based on the lease boundary $ profit/BOE
  - Progressive tax, i.e. the higher the unit profit the higher the tax %
  - Credits for new investment activity

- In 2009 Alaska was looking to support activities to bring the over 30TCF of North Slope gas to market.
  - Even with price parity in the market the lease boundary value per boe for gas would be substantially lower than that for oil
  - Question was asked, is Alaska better off keeping ACES as is with its inherent built in subsidy or should oil and gas be taxed separately?

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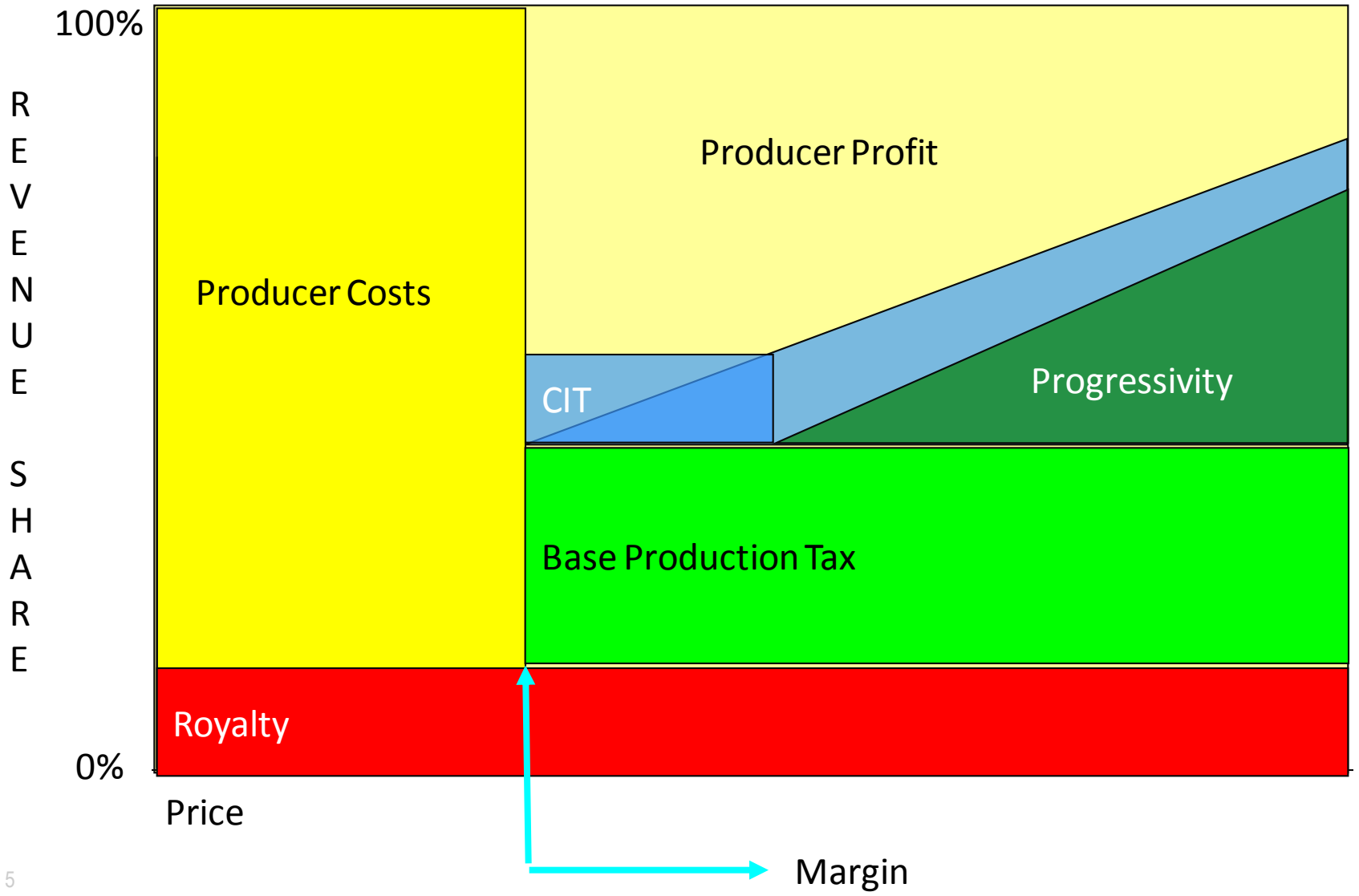
Cash Flow with ACES General Structure



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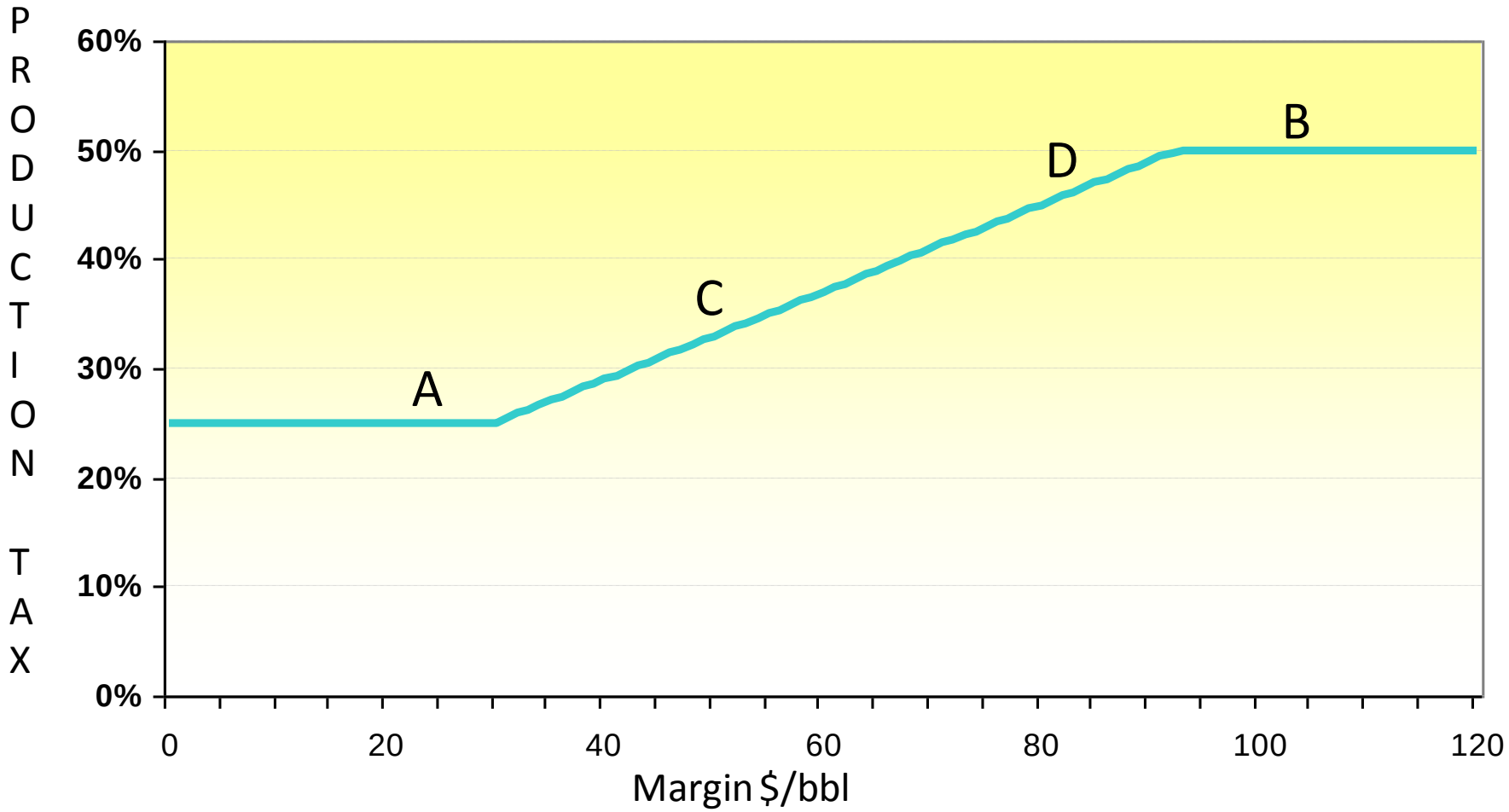
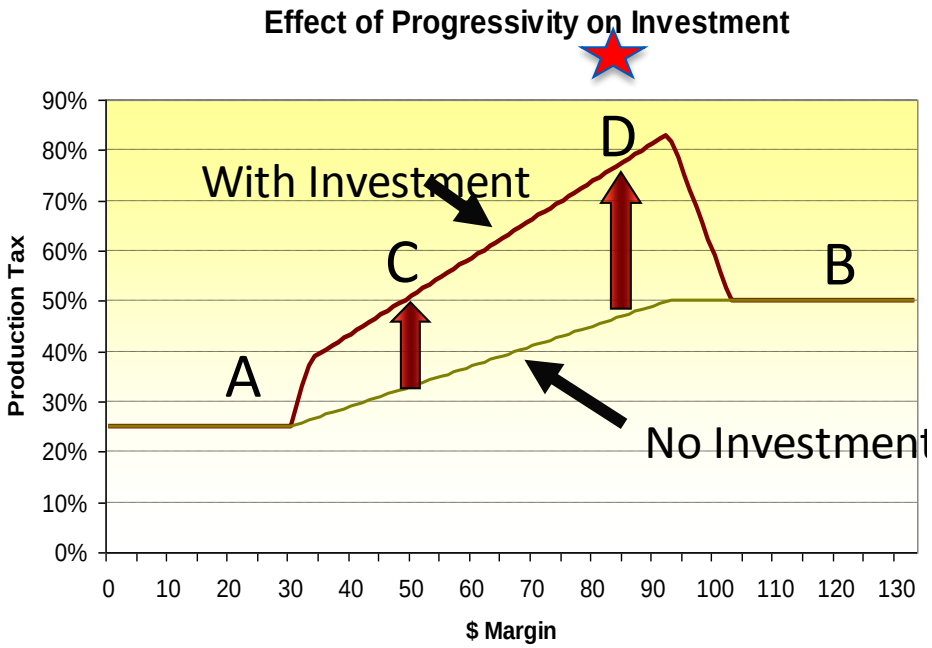
ACES and Progressivity



Federal and State Income tax impacts excluded

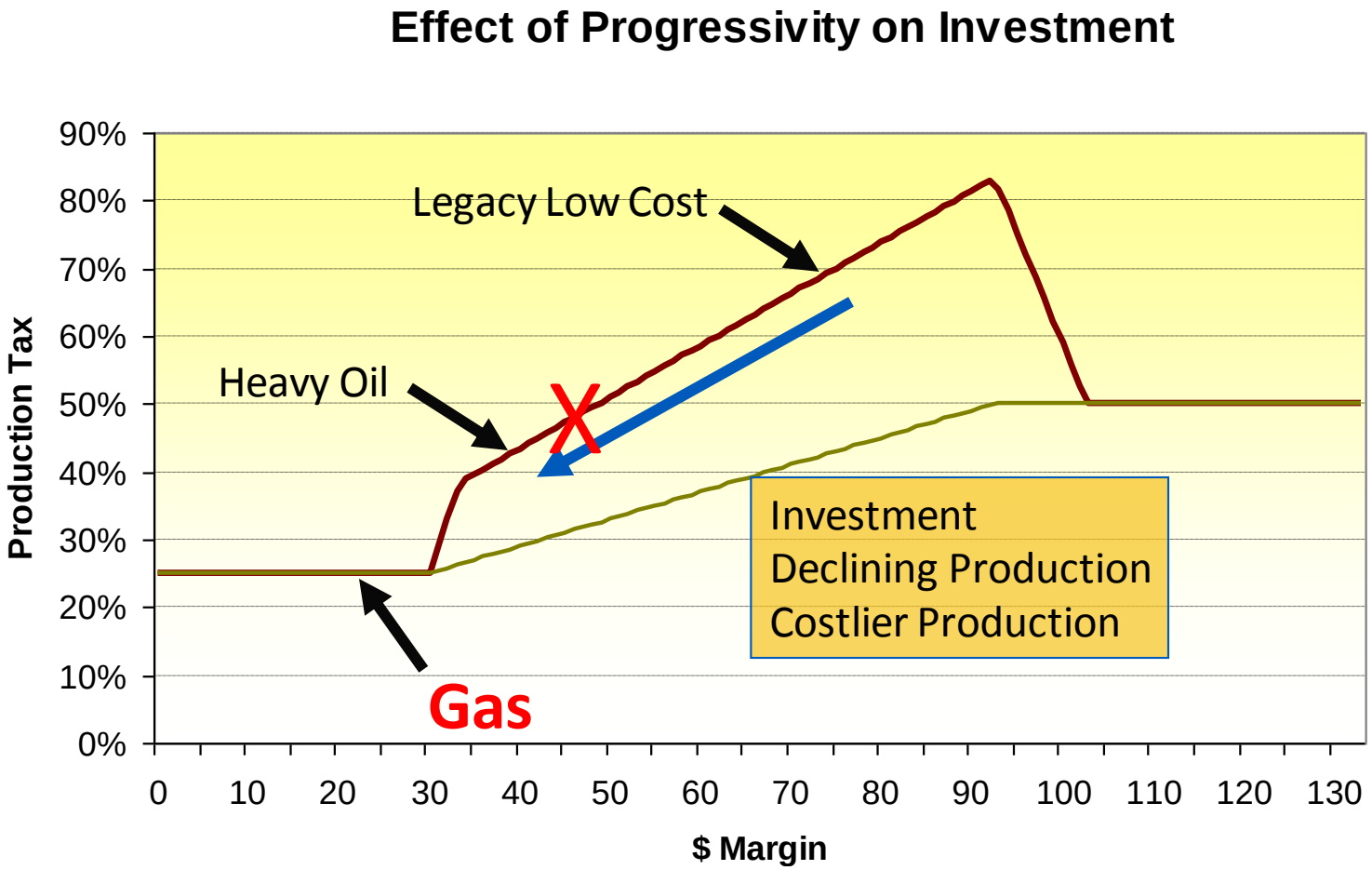
What was the impact of gas investment on the NS tax to be paid?



Simple Deterministic

Monte Carlo

Investment in less unit profitable projects would cause a NS company to “slide down” the progressivity curve



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Our Case Study – Alaska Tax Design for Gas Production

- In 2007 Alaska passed the ACES petroleum tax

- In 2009 Alaska was looking to support activities to bring the over 30TCF of North Slope gas to market.

- During the legislative season 4 sets of "economists" set out to advise the Governor and legislators
  - Legislature's Consultant
  - Department of Revenue
  - Department of Natural Resources
  - Big 3 BP, COP, XOM

- New fields, old fields, TAPS tariffs, company ring fence, 3rd party access, etc.....

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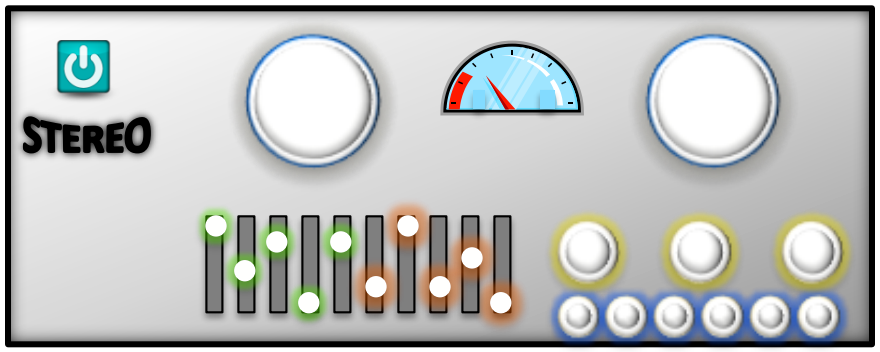
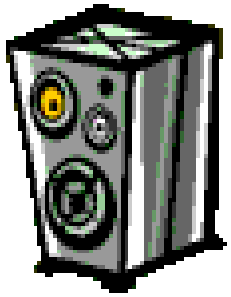
Modeling Fiscal Systems for Project Analysis is like operating an old fashioned stereo amplifier



Some items have a much bigger impact than others

Some just ‘fine tuning’

- **Oil Price**
- **Production**
- Depreciation
- Uplift
- Ring fencing
- Allowable Costs
- First Cut
- Petroleum Tax Deductibility
- Cost Oil Caps
- Profit shares
- Price/Profit caps
- Third Party Access
- Domestic Market Obligation
- Abandonment Sinking Fund



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However, Designing Petroleum Fiscal Policy ……

- At first glance, compared to our simple project amplifier, design and modelling of fiscal policy more resembles the look of a large mixing board:

- Designing a fiscal systems requires:
  - Developing a set of high level principles to be achieved
  - Deciding which of the several dozen items that can be incorporated into a fiscal system would achieve the desired results under any number of different development scenarios

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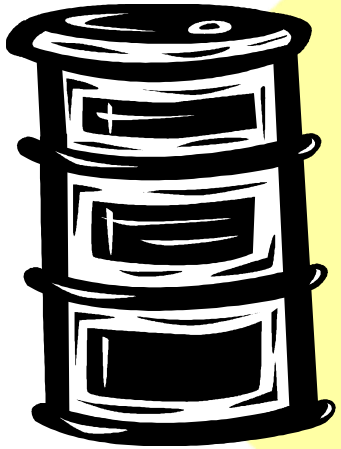
It's all about how to split the barrel…

$$$



FISCAL SYSTEM

COMPANIES AGREEMENT

Royalty

Production Taxes and Fees

Government Profit Share

Consortia Profit

Company A

Company B

CAPEX and OPEX

Government Take

Contractor Take

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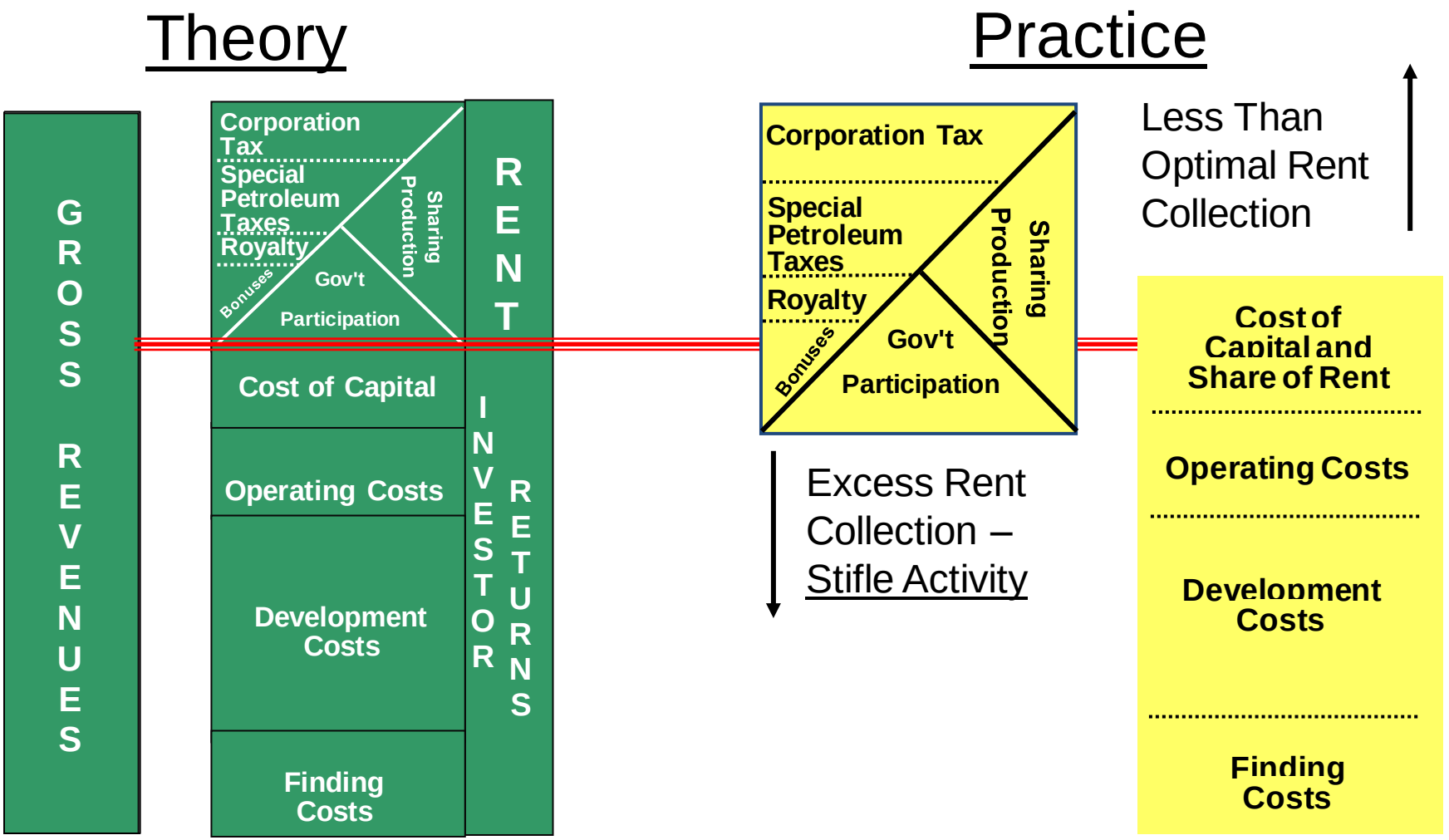
Fiscal Design is about allocating Economic Rent…..



…. For dozens of possible development scenarios

Application of the K.I.S.S. Principle

- The more complex the challenge, the more important it is to get the basics right!

- Review:
  - 4 sets of economists,
  - 10's of $Billions at stake,
  - maintain combined BOE taxation (maybe with a few minor tweaks) or design separate oil and gas taxation.

Application of the K.I.S.S. Principle

- **Step 1** – Calibrate the models to remove minor errors from the debate
  - Remove bias from cash flow calculations
  - Make sure fiscal parameters are interpreted the same

- **FLAT, FLAT, FLAT**
  - Production, Price, Costs

Application of the K.I.S.S. Principle

- **Step 2** – Agree a common set of inputs and again recalibrate models
  - Check that inflation, economic limits, dependent variables are all handled the same
  - Use rounded simple parameter changes
    - E.g. 10% changes, constant rate profile changes, simple regressions
    - Make sure fiscal parameters are interpreted the same
- **Focus on 3 key parameters**
  - Oil price
  - Oil/Gas price parity
  - Cost to access gas markets (transportation/processing)
- **ONE VARIABLE AT A TIME**

Application of the K.I.S.S. Principle

- **Step 3** – Evaluate different combinations of fiscal design parameters
  - Early on all 4 teams were experiencing some strange anomalies
  - First major review showed 4 very different sets of results leaving the government and legislators more confused versus more informed
  - Parties all agreed to go back and work harder

- **ISOLATE AND UNDERSTAND THE CAUSE BEFORE MAKING FURTHER CHANGES TO ELIMINATE THE ANOMALY**

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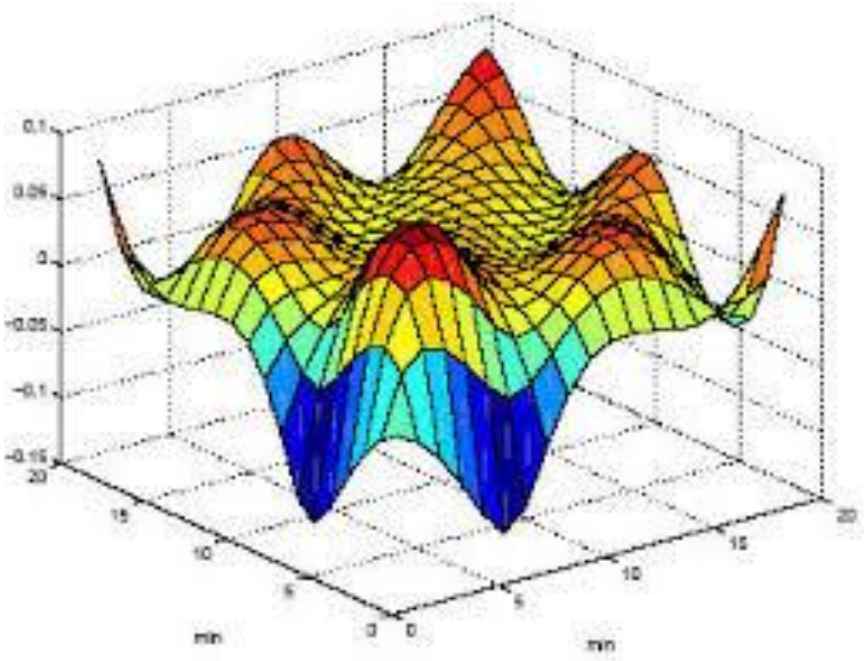
Thinking through the solution

- Team 1 ran over a million iterations using @Risk
  - Kept refining variable distributions in order to understand result anomalies
- Team 2 did a major redesign moving away from the State's comfort zone in order to eliminate the anomalies
- Team 3 was stumped
- Team 4 used the Tables function looking at over a dozen two variable associations

Parity versus Oil Price and Resultant Tax Subsidy



@Risk

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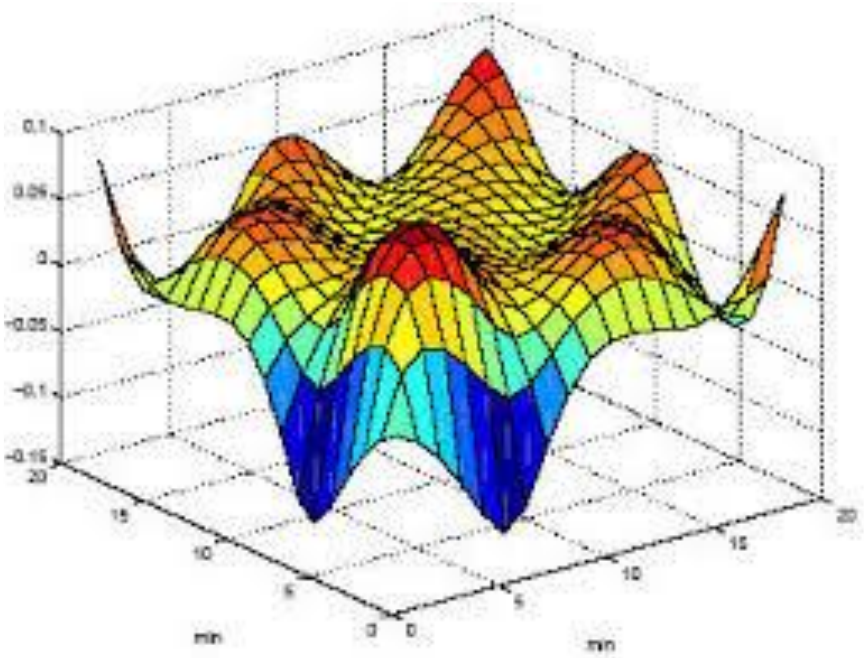
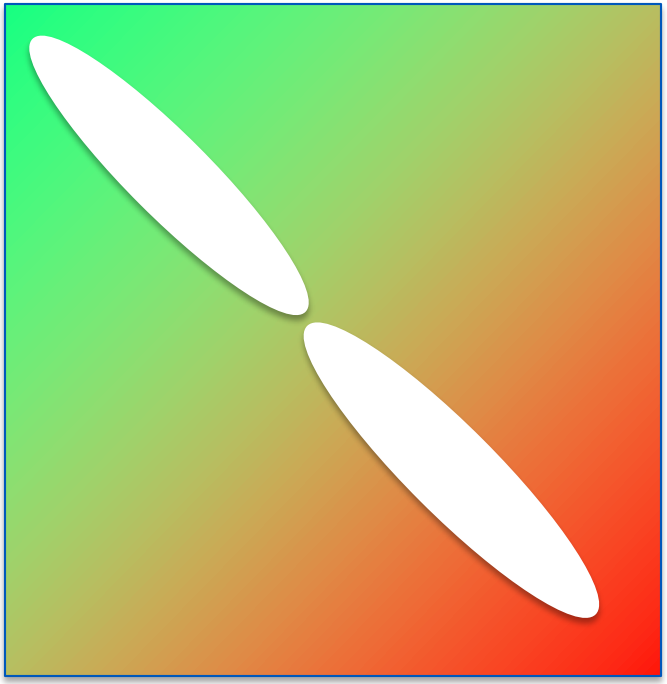
Parity versus Oil Price and Resultant Tax Subsidy



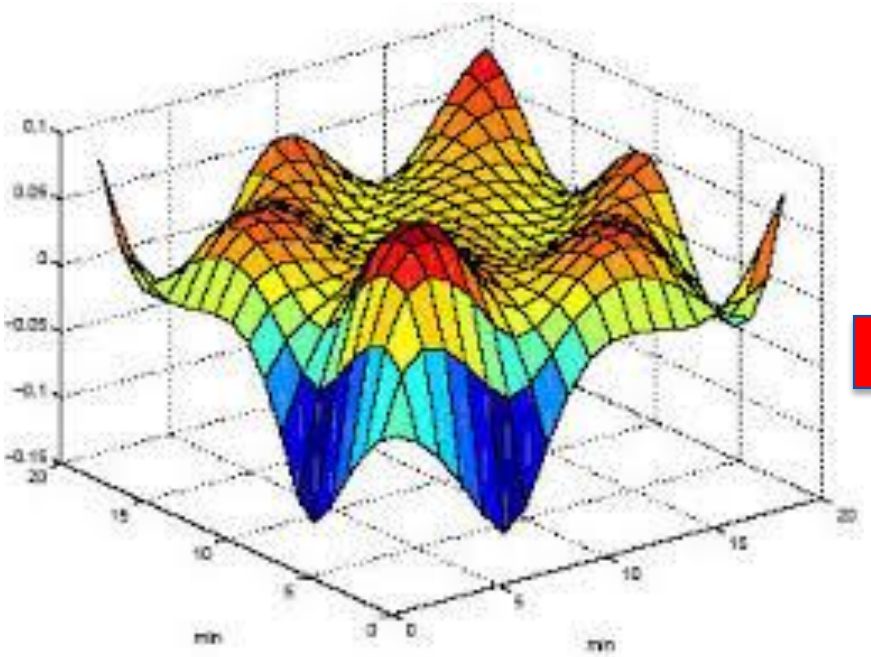
@Risk



Tables

Parity versus Oil Price and Resultant Tax Subsidy

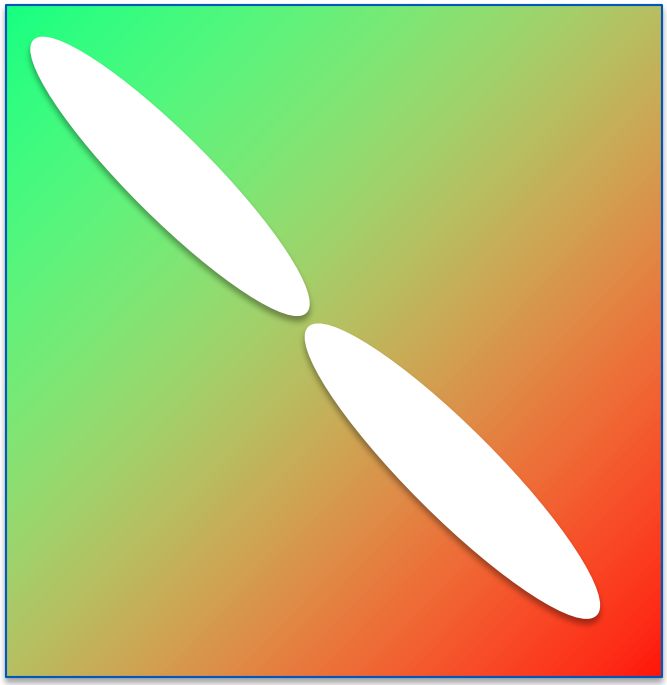
After fine tuning, two months and millions of runs made



@Risk

Parity versus Oil Price and Resultant Tax Subsidy

- After designing 14 tables and running 5 different type fields, in a day they came up with this:



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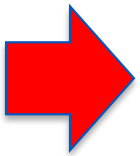

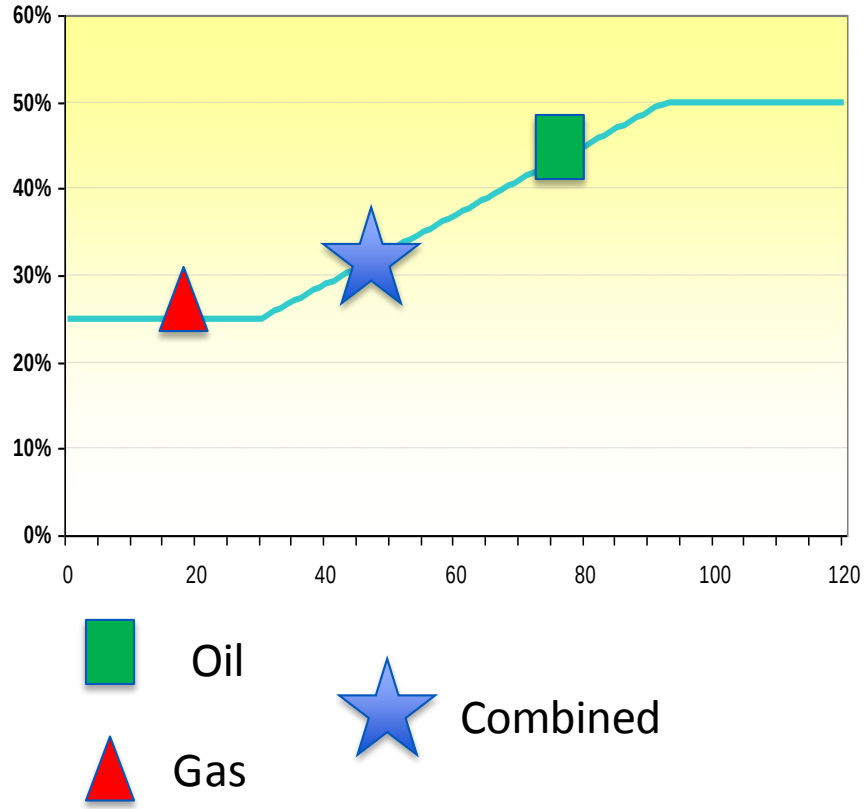

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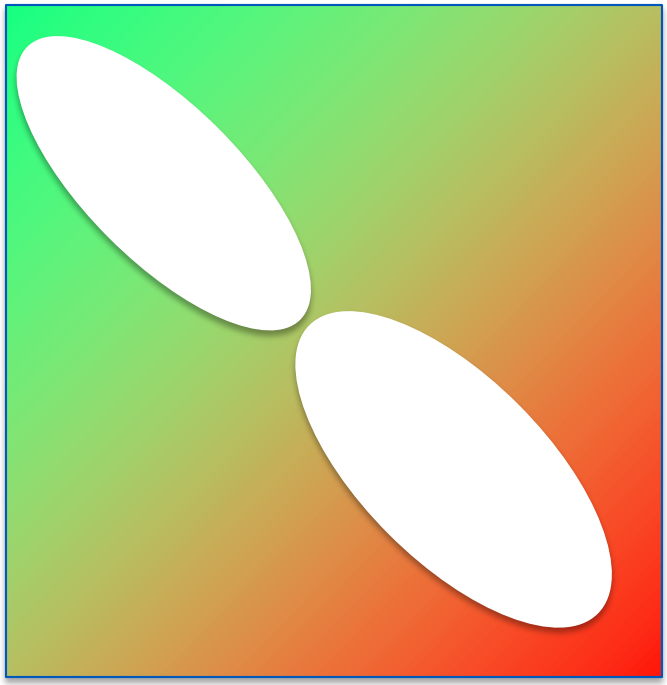

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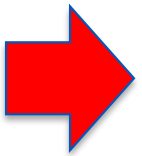

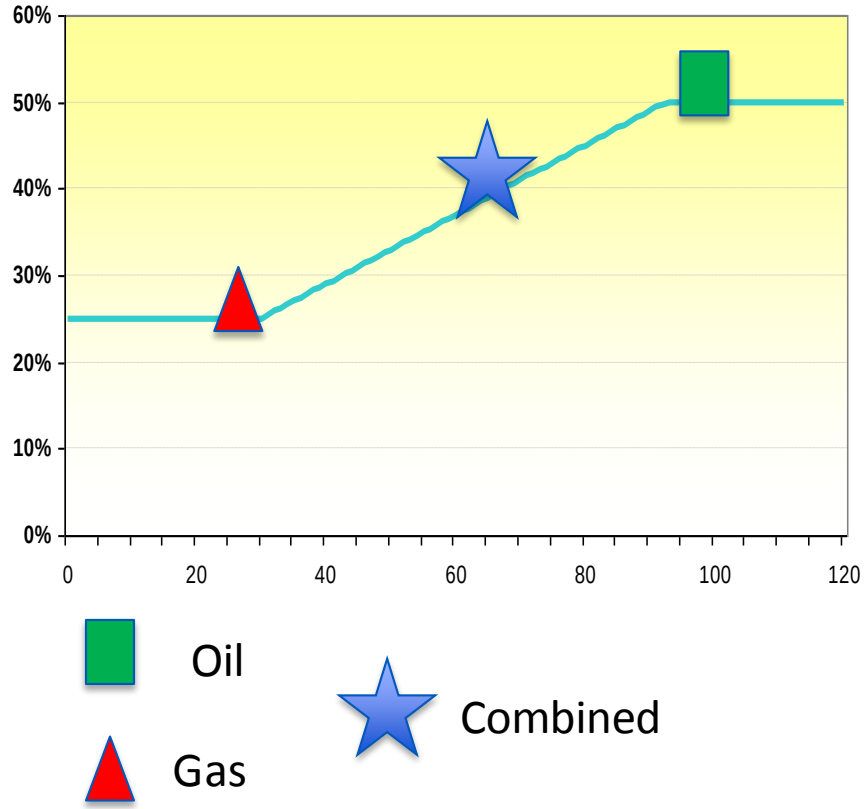

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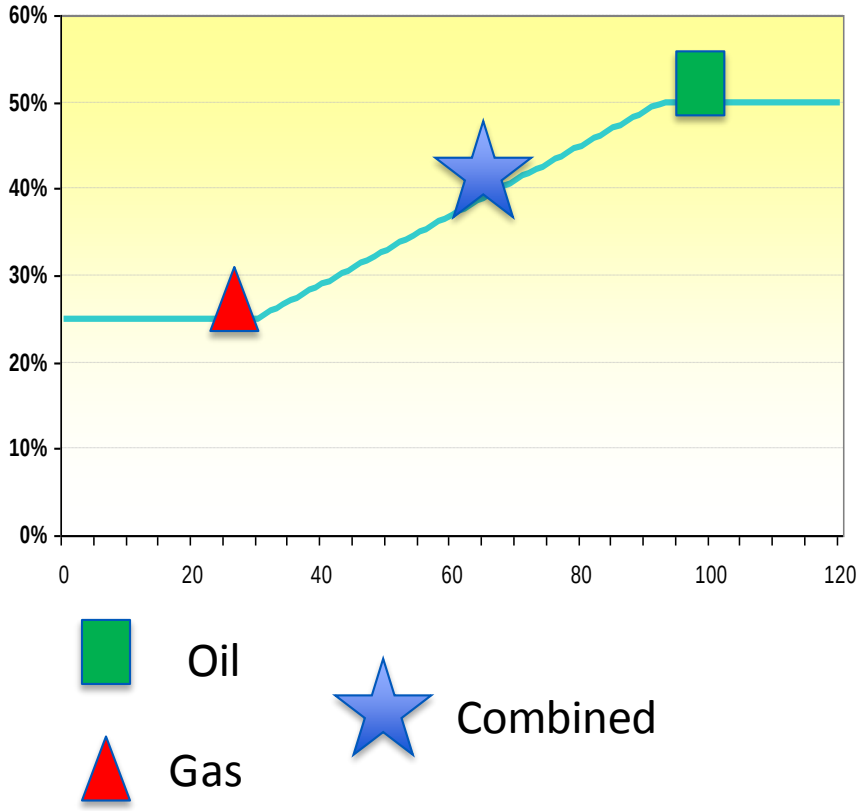
“Romulan War Bird versus the Bouncing Balls”

- After application of the latest tools, millions of runs and the intervention or world renowned experts, team 1 never uncovered the reason for the anomalies, something Team 4 did in one day the old fashioned way! :



Perspectives

- The more complex the problem, the more important it is to start as basic as possible
  - You can still have a very detailed and complex model
  - Test it with simple inputs – FLAT FLAT FLAT
- Slowly add additional elements and components while maintaining a full understanding of the CAUSE of various outcomes
- Ensure your results can be understood by people of all educational levels