Burlington Resources Canada-MIT Alliance

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Client: Burlington Resources Canada

- BRC is headquartered in Calgary with a staff of 700 employees. It is one of the major producers in the Western Canadian Sedimentary Basin, which provides about 15% of North America's natural gas.
- Major acquisition in 01 and 02, 800 wells planned for 03, and 5%~8% growth rate target.
- The basin is maturing, which means declining reserve. Yet profitability is still healthy due to high gas prices and improving technology
- Q: ***proactive measures*** that can help them weather possible ***limitation to growth*** in the near future

(Courtesy of Burlington Company. Used with permission.)

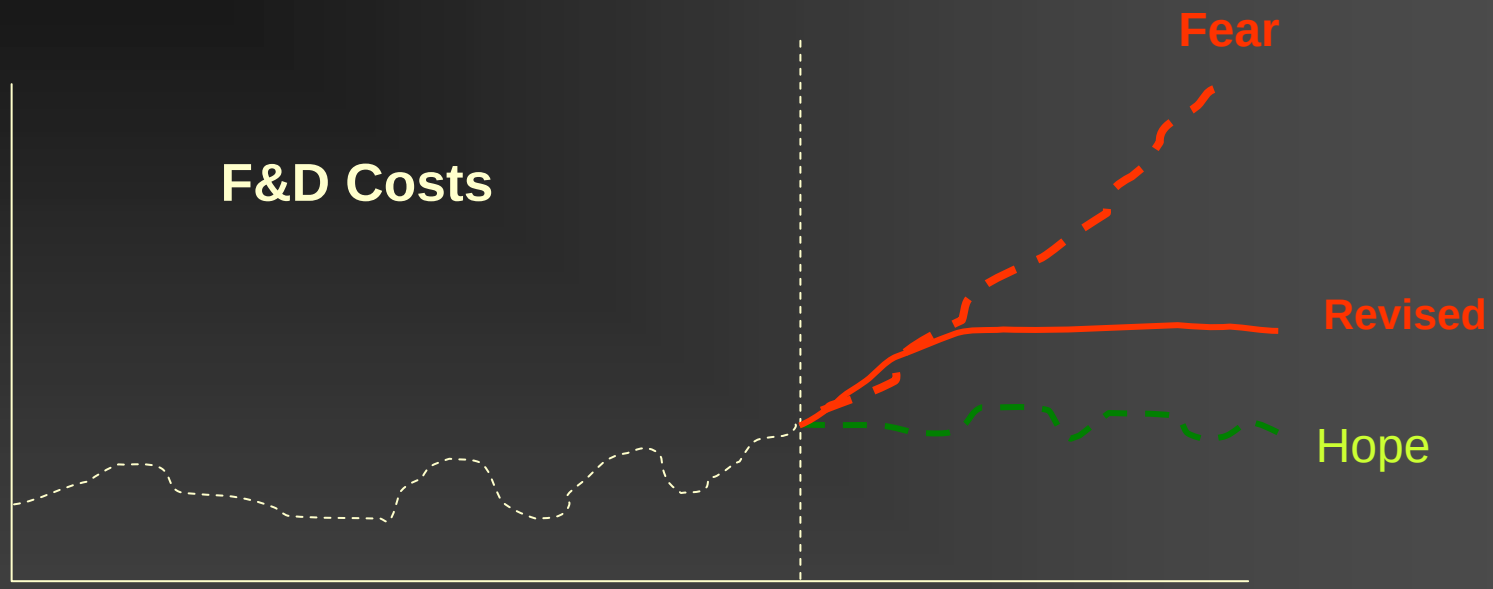
Our Contacts

- The People
  - George: Consultant and system dynamicist
  - Roy: Manager, Reserves
  - Jeff: Head of Planning
  - Colleen: Commercial Analyst
  - Rob: Head of Engineering
  - Tom: Management Team
- The Process
  - Weekly conference call, along with web-based conferencing

The Most Valuable Pieces of Information BRC walks away with:

- To increase the number of licenses for drilling, you need to apply for fewer licenses.
- The more months of inventory you try to create, the fewer resources you need to do so.

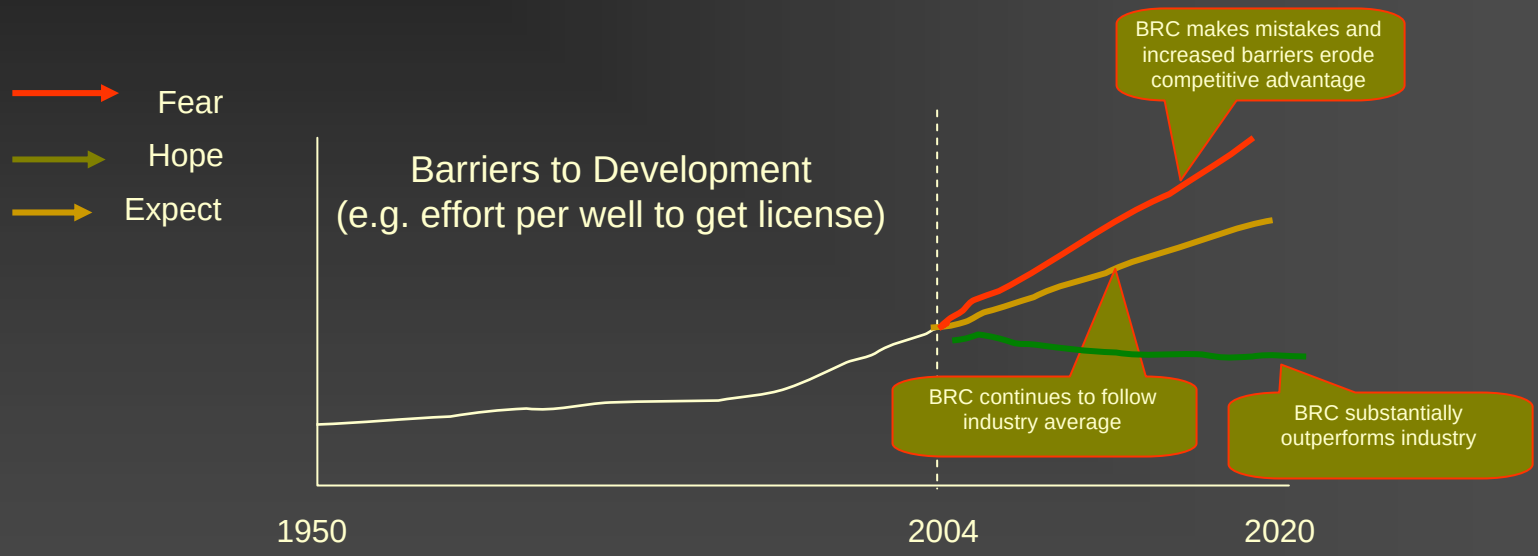
What are they afraid of?



"Don't see fear really happening … WCSB still has 'a sh*tload' of gas economically recoverable (90 Trillion Cubic Ft).

(Courtesy of Burlington Company. Used with permission.)

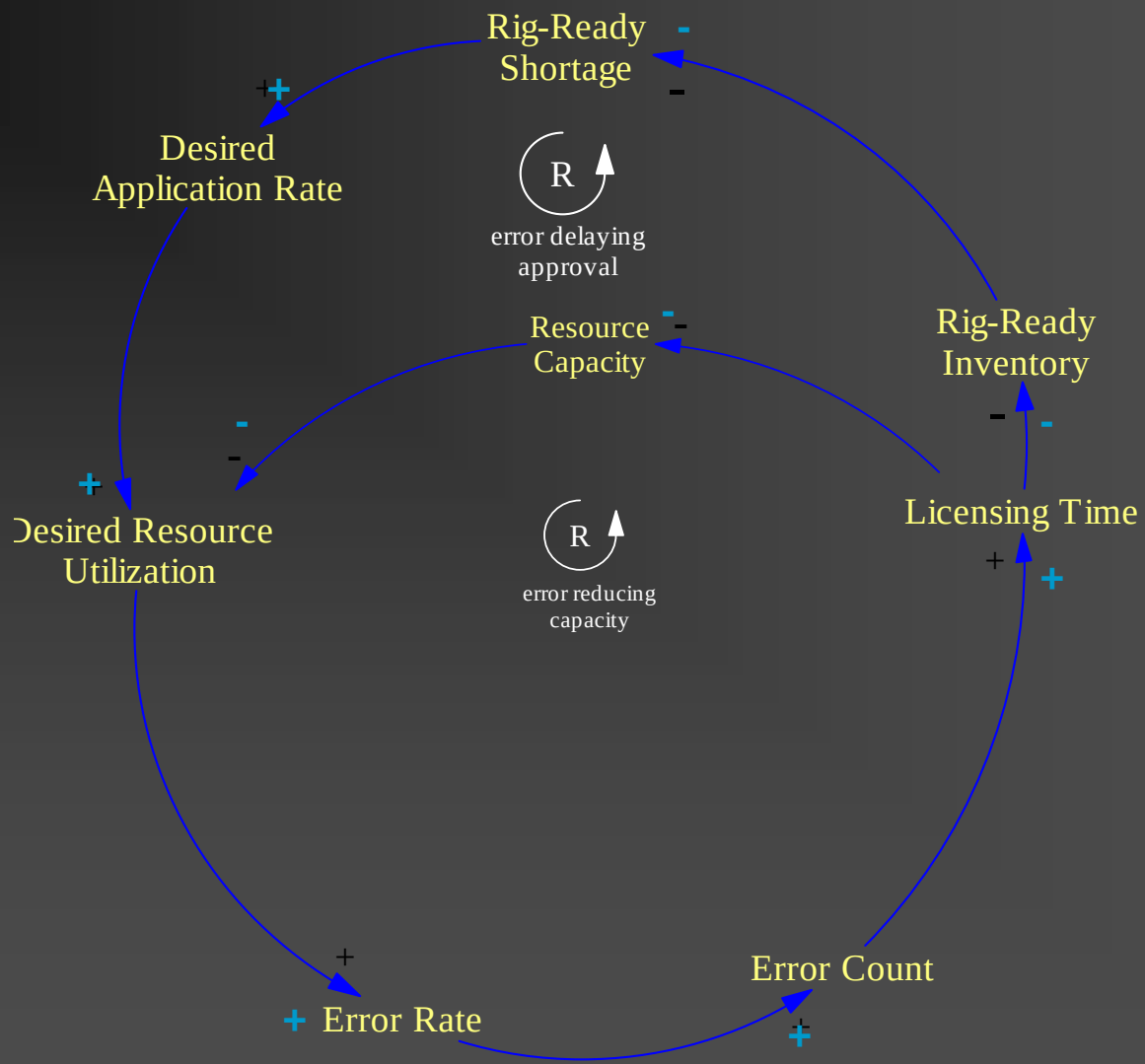
But, how hard will it be to obtain licenses to drill?



More or Better?

- Burlington has $15+ Million to invest in “improvement activities”
  - Where/how to invest it?
- Choices:
  - Opportunity Development→greater inventory of potential sites ready for license application
  - Process Improvement→better internal process for license application
- Which would lead to lower Barrier to Development? (reduced effort per well to receive license)

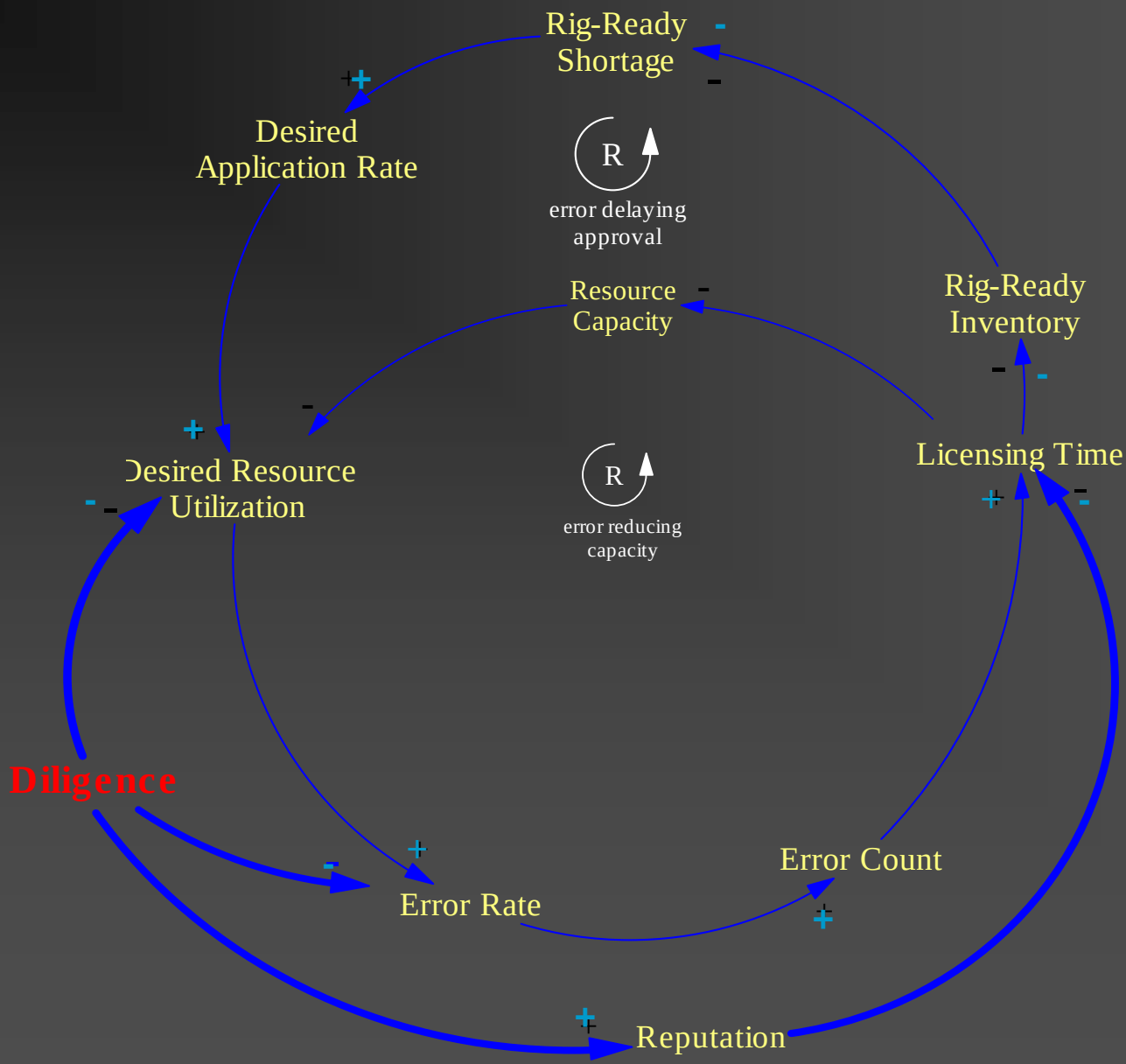
Loop Description of the Problem



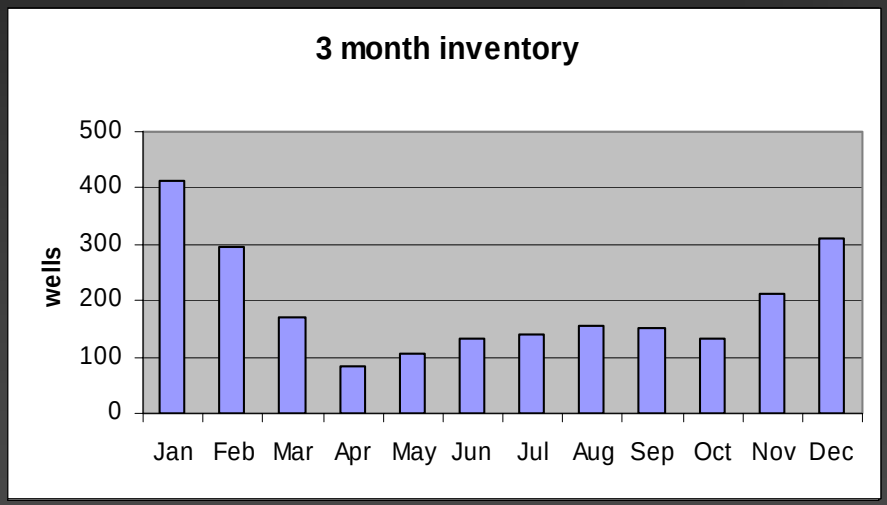
Policy lever: ‘Diligence’

- First discussed in detail during 6th week
  - “Each non-diligence increases enforcement regulation”
  - “As you exceed company’s capacity, errors increase”
- ‘Diligence’ is about quality over quantity
  - Taking more time to do environmental studies
  - Working slower, but better

Loop Description of Strategy #1:

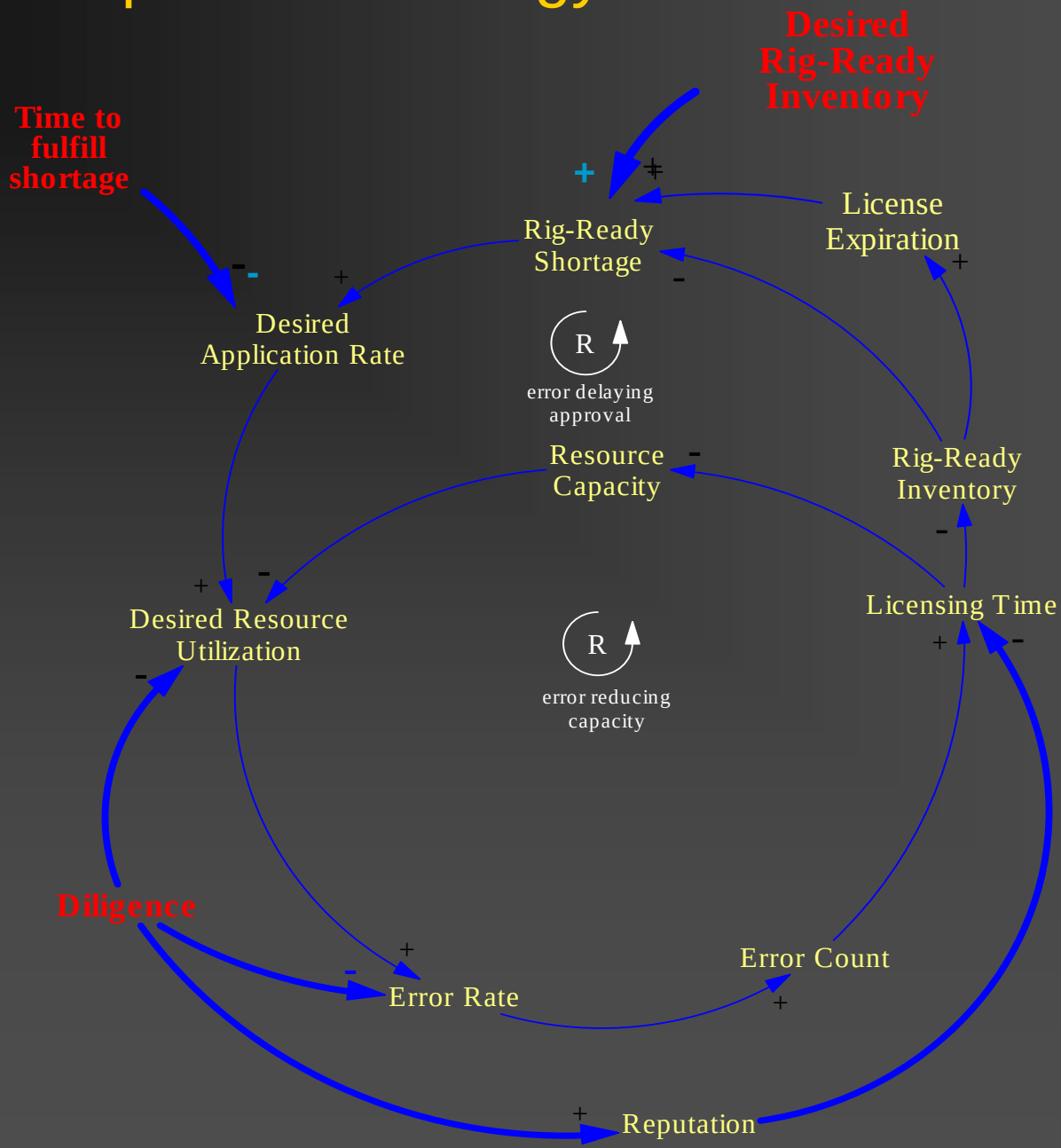


Seasonality in Drilling Schedule



- The number of wells drilled depends strongly on season. (ground condition, soil condition, environmental regulations)
- This translates to fluctuation in the Rig-Ready Inventory

Loop Description of Strategy #2:



BRC Takes the Advice to Heart:

- “Never, ever, ever decrease your diligence, esp. when under pressure”
- “Appropriate for licensing group to have rules oriented culture”
- “Have to be very cognizant of forward look to get inventory where you want it”
- “I want to go show this to x in service”

Consulting Process:

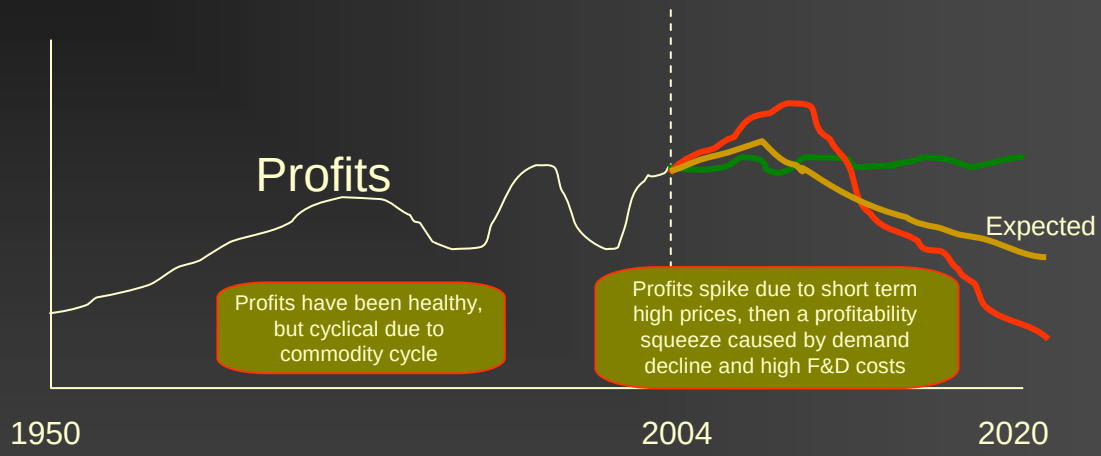
Standard Method	Standard Method
Standard Method	Standard Method
Standard Method	Standard Method
Standard Method	Standard Method
Standard Method	Standard Method
Standard Method	Standard Method
Standard Method	Standard Method

- Reserve Distribution (over time)
- Oil Company Profits
- Commodity Price
- Production Decline
- Royalties
- Drilling cost per meter
- Completion Technologies
- Drilling Technology
- Seismic Technique
- Visualization Technologies
- Proven Reserves
- Drilling Rig Availability
- Gas Storage Potential
- Transportation Cost
- Pipeline Capacity
- Infrastructure Cost over time
- Infrastructure Density
- Environmental Considerations
- Public Opinion
- Access Difficulty
- Approval Time
- Price of byproducts
- Kyoto
- Federal & Provincial Politics
- Carbon Taxes
- Tax incentives
- Alternate Methane Sources
- US/Can Exchange Rate
- US Protectionism
- Demand for Natural Gas
- Seasonality
- Cost of Substitutes
- Geographical Distribution of remote reserves
- Concentration of mineral rights
- Industry concentration
- Area concentration
- Explore vs.. Harvest mentality
- Rate of Acquisition
- Finding & Development Cost
- Cost of LNG
- Capital Stock turnover
- Climate Change
- Market perception
- Skilled labour supply
- Public Opinion (for investment)
- Resources for R&D
- Resources for Marketing
- Resources for…..
- Regulatory overhead (&oversight)
- Terrorism
- Alternate Energy supply & cost
- Non-hydrocarbon energy sources
- Conservationism
- Price volatility
- Deregulation
- Basin connectivity
- Switching Cost
- Diversion of Natural Gas from Market to Oil Production
- Energy Efficiency Technologies
- Public expectation of comfort
- Geopolitical forces
- Cost of Mineral Rights
- Cost of finding reserves vs. buying companies
- Barriers to Development
- Global Impact
- Cost of Steel
- Cost of waste disposal
- Water Consumption
- Process Efficiency
- General & Administrative Costs
- Share Price
- Cost of Capital
- Company Revenue
- Company Profit
- ROCE
- Corporate Structure
- Nationalism
- Security of Supply
- Market share of Natural Gas for Energy vs.. Petrochem feedstock
- Fuel Switching

More than enough variables…

The Ever-Evolving Reference Mode—modification made after tracing the causal loops constructed

Feb 25



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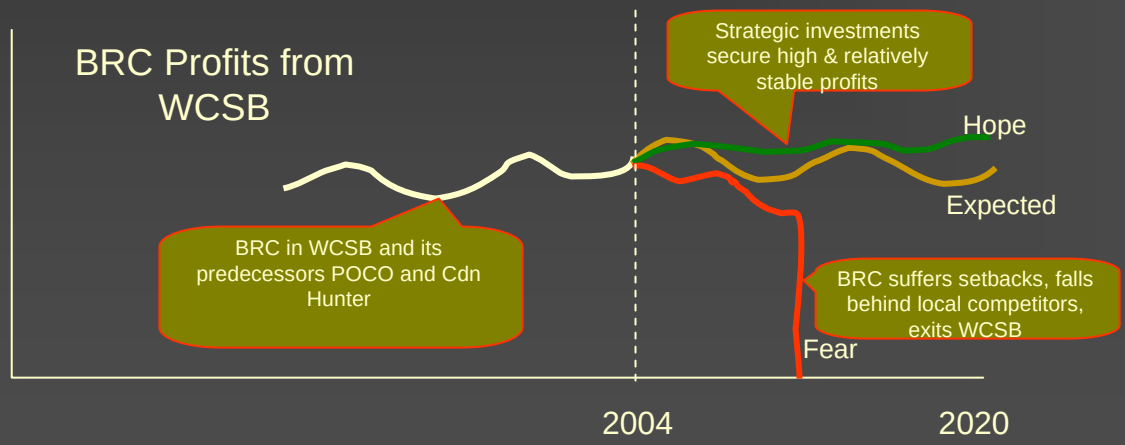
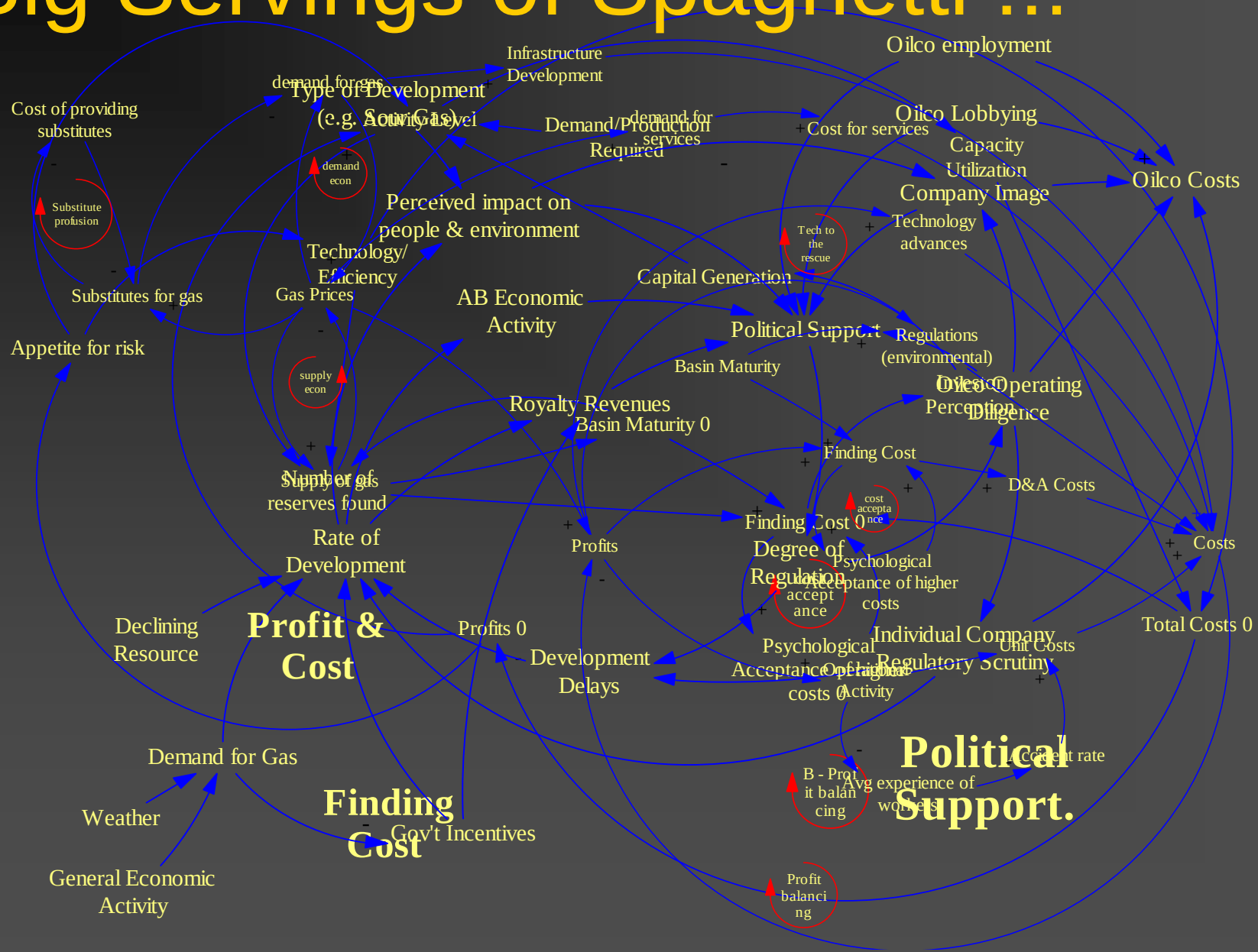
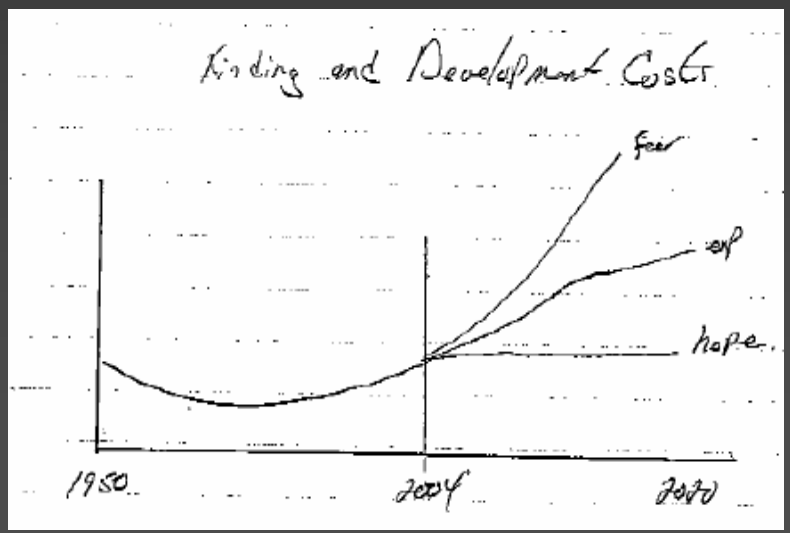
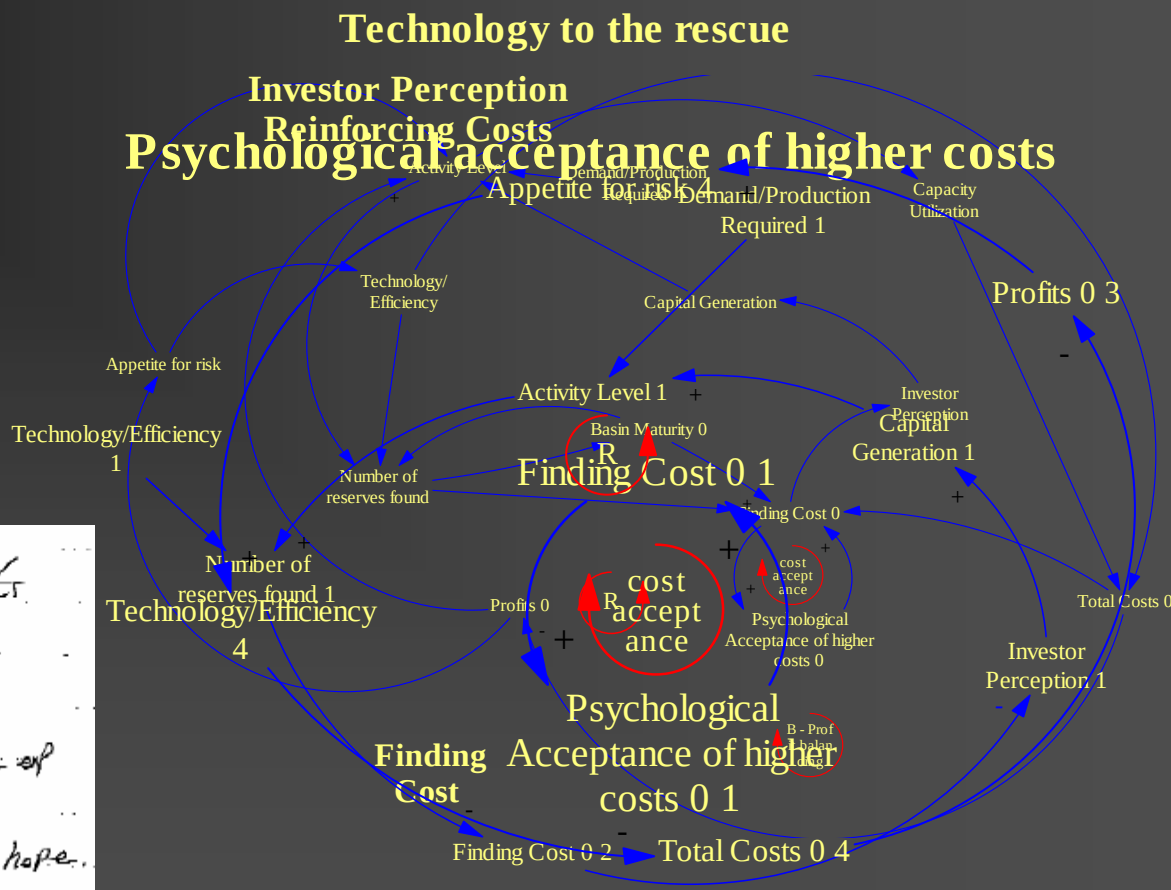


Big Servings of Spaghetti !!!

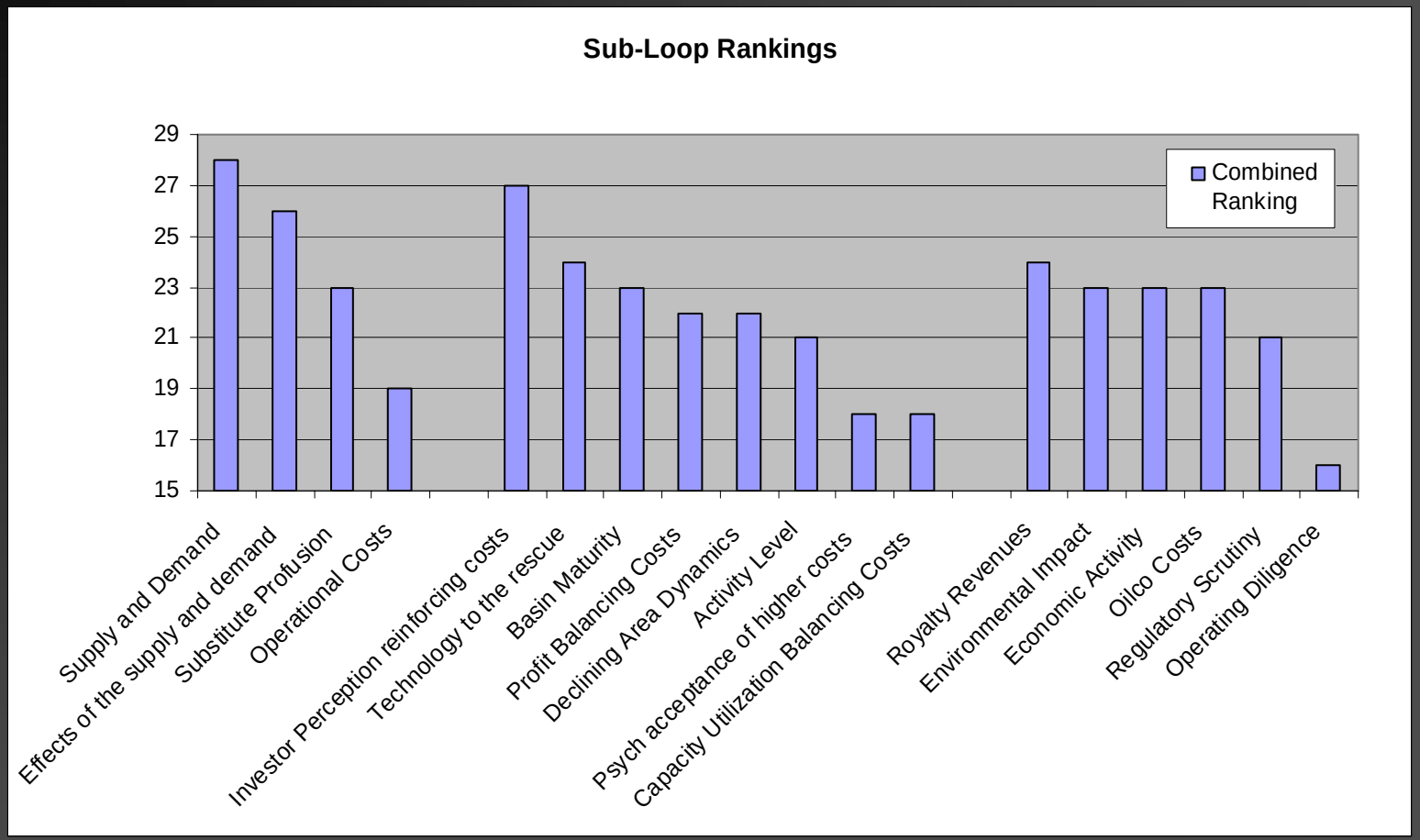


Homemade Remedy to Complexity—Rank the Importance of the Sub-Loops Bringing the Clients Back to Focus





Reference Mode	Sub-Loop	George	Roy	Jeff	Rating
Profits & Costs	Supply and Demand	10	9	9	28
Profits & Costs	Effects of the supply and demand	8	9	9	26
Profits & Costs	Substitute Profusion	8	7	8	23
Profits & Costs	Operational Costs	6	6	7	19
Finding Costs	Investor Perception reinforcing costs	5	8	5	27
Finding Costs	Technology to the rescue	7	10	10	24
Finding Costs	Basin Maturity	7	5	6	23
Finding Costs	Profit Balancing Costs	6	8	8	22
Finding Costs	Declining Area Dynamics	9	6	8	22
Finding Costs	Activity Level	8	9	7	21
Finding Costs	Psych acceptance of higher costs	9	7	5	18
Finding Costs	Capacity Utilization Balancing Costs	7	7	8	18
Political Support	Royalty Revenues	8	8	7	24
Political Support	Environmental Impact	8	9	6	23
Political Support	Economic Activity	7	7	10	23
Political Support	Oilco Costs	6	5	5	23
Political Support	Regulatory Scrutiny	6	8	7	21
Political Support	Operating Diligence	8	7	8	16



It became clear that our clients had their focus on factors which they could not control; this brought everyone's attention back to relevant AND controllable policy levers against errors !!!

We Learned from the Client Reception of the Different Generations of Models that…

- Model need not reflect operational details of client. In fact, our clients resisted model version 1.0 initially due to too much operational detail.

- At the end, we had to remind the clients that the model is not reality and should not be used to generate magical numbers for policy-making.

Finally…

It's hard letting go of our baby at the end!

Last but not Least…

“I would like your mailing addresses so we can send you a small token of appreciation.”

-George Coppus

May 12th, 2004