

THE NEW RISK PROFILE FOR ENERGY COMPANIES

25 FEBRUARY 2014

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Introduction

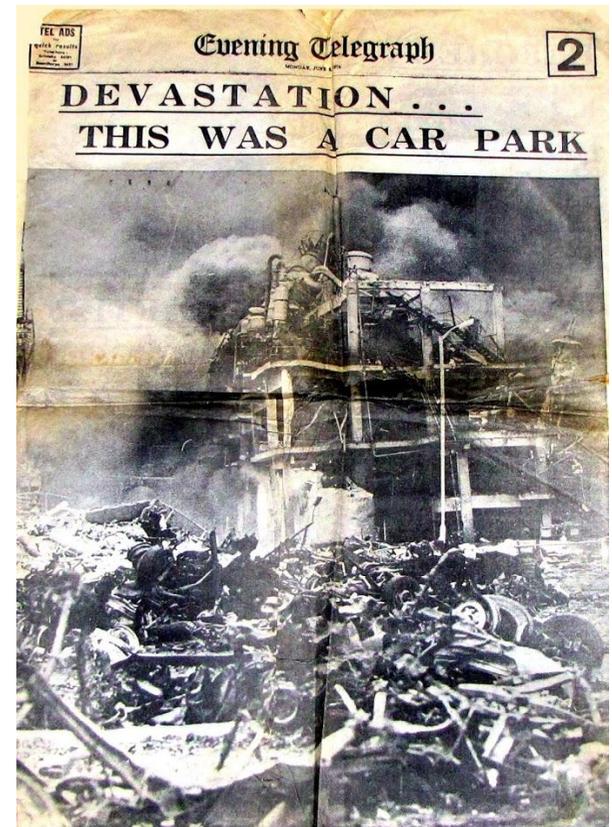
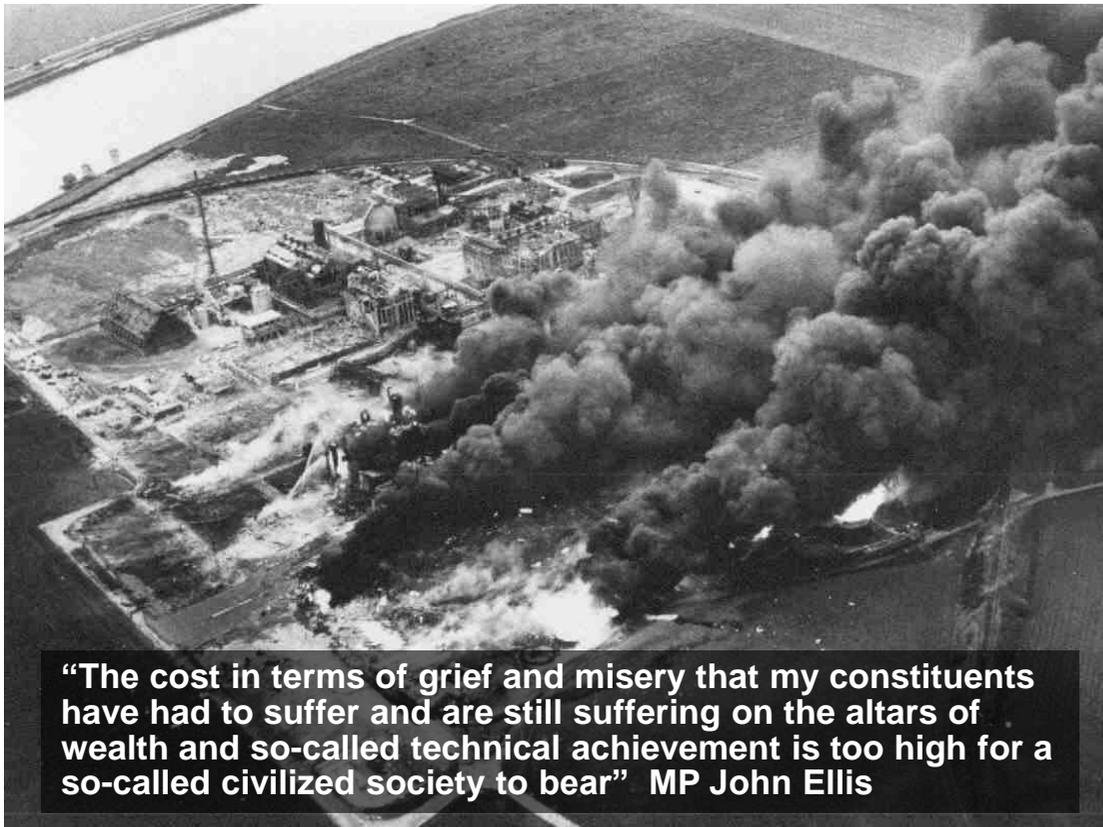
Risk & the Energy Industry

- The Energy business has always meant 'risk'
 - Inherent properties of the materials being handled – flammable, toxic, corrosive...
 - Reservoirs cannot be 'seen', nor can their characteristics be accurately pre-defined
 - Harsh operating environments – remote locations, rough seas, deserts, polar regions
 - Extreme process conditions – high temperatures, high pressures, fast machinery speeds
 - Complexity – highly interactive human-electro-mechanical systems
 - Capital intensity – expensive equipment, concentrated value, long replacement times
 - Volatile margins – cyclical nature, impact of speculators, governments and cartels
- The industry was once very different to where it is today
 - Previously a 'pioneer' culture in which accidents were regarded as to be expected
 - Now is one where death and injury rates are essentially negligible and employees are safer once they have arrived on company premises.
 - The 'high reliability organization' approach relies on safety being the primary business deliverable
- But this has not necessarily been an 'organic change'....
 - Much of the progress made has be down to repeating the same errors over and over

Gamechangers...

Critical Turning Points for Risk Management in the Energy Industry

- June 1974 – Flixborough (Nypro UK), 28 dead, USD 270 million loss
 - First high-profile incident to receive widespread media coverage
 - Legacy: plant modification/change procedures; HAZOP studies; piping design codes



Gamechangers...

Critical Turning Points for Risk Management in the Energy Industry

- July 1988 – Piper Alpha, North Sea – 167 fatalities, USD 3.6 billion loss
 - Insurance industry's costliest man-made catastrophe
 - Legacy: offshore platform design and layout; emergency procedures; chain-of-command; requirement for a Safety Case; more progressive 'goal setting' legislation



“Safety is not an intellectual exercise to keep us in work. It is a matter of life and death. It is the sum of our contributions to safety management that determines whether the people we work with live or die” Sir Brian Appleton, Piper Alpha Investigator

Gamechangers...

Critical Turning Points for Risk Management in the Energy Industry

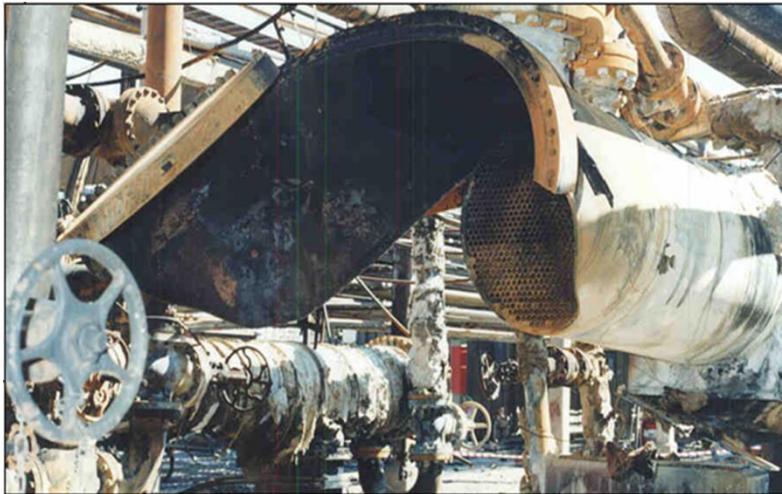
- October 1989 – Phillips, Pasadena – 23 fatalities, USD 1.4 billion loss
 - Largest onshore insurance claim in the energy insurance industry, by a factor of two...
 - Legacy: isolation procedures; firewater system integrity; ensuring procedures are followed
 - Universal recognition that the lessons of Flixborough had been ignored in North America



Gamechangers...

Critical Turning Points for Risk Management in the Energy Industry

- September 1998 – Esso Longford, Australia – USD 740 million loss
 - Cut off gas supplies to state of Victoria for two weeks
 - Largest class action suit in Australian history, on behalf of over 1 million gas consumers
 - Legacy: periodic HAZOP reviews; management system audits; process vs personal safety; ‘normalization’ of alarms

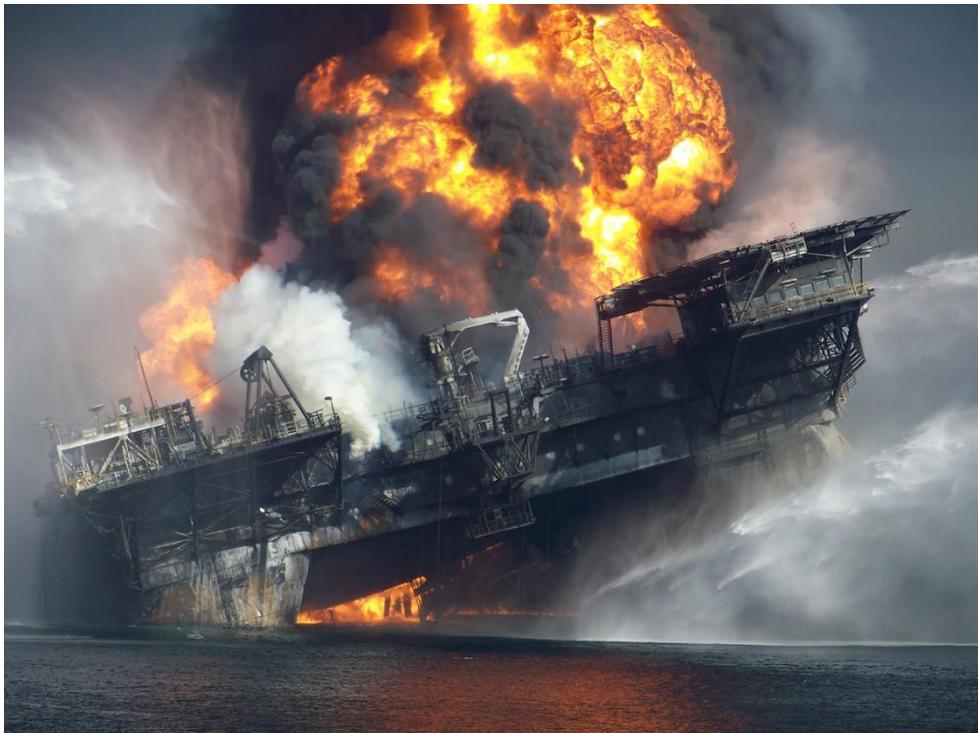


“The ultimate cause was the failure of Esso management to equip its employees with appropriate knowledge to deal with the events that occurred, a reduction in supervision at the Longford plant, the failure to conduct a crucial hazard study, and a desire on the part of Esso to cut costs” Sir Daryl Dawson, Royal Commission report

Gamechangers...

Critical Turning Points for Risk Management in the Energy Industry

- April 2010 – Deepwater Horizon blow-out and explosion (Macondo)
 - 11 fatalities, resulting spill continued for 87 days, releasing an estimated 4 million barrels
 - Temporary hold on all new offshore drilling leases
 - Immediate cost USD 590 million, liabilities/fines could reach USD 20 billion
 - Legacy: ‘barrier’ management, division of responsibilities; scale of incident now ‘credible’

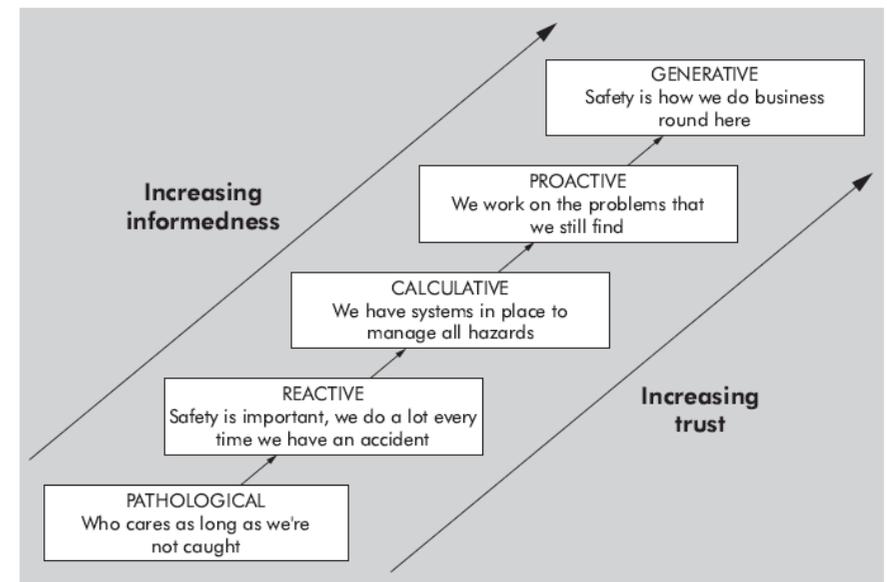


"This oil spill is the worst environmental disaster America has ever faced... Make no mistake: we will fight this spill with everything we've got for as long as it takes. We will make BP pay for the damage their company has caused" President Barack Obama

Learning from Losses

The Development of Loss Prevention Systems & Culture

- Energy companies have constructed sophisticated risk identification, mitigation, prevention and management systems, in order to cope with the array of risks surrounding them – most ‘forward leaps’ have been in response to losses
- Energy, along with the nuclear, commercial aviation and manned-space exploration industries, can be considered to be at the forefront of **operational** risk management
- The slow progression from a ‘pathological culture’ (where safety is not a consideration) to a ‘generative culture’, where the belief that all losses are preventable, is a significant challenge but is something which some companies have achieved and continue to sustain
- The best performers are now those which adopt the concept of a ‘High Reliability Organization’, where the intention is to become ‘ideal organizations’



Performance in the wider Risk Management Sphere

Does the focus on Operational Risk Management have negative effects?

- But outside operational risk management, how do Energy companies fare?
 - **STRATEGIC** – business diversification (integrated model vs sector model); response to alternative energy technologies; preparedness for future environmental legislation; non-performance of investments; nationalization of assets or conflict with host governments
 - **SUPPLY CHAIN** – robustness to natural disasters in supplier/customer territories; impact of terrorism on pipelines and shipping; credit worthiness of supply chain members
 - **FINANCIAL** – devaluation of key trading currencies; margin volatility; contractual exposures; M&A ‘surprises’
- In these areas, the Energy industry is generally considered to be a follower rather than a leader
- What is the role of the insurance industry in filling these gaps?

So what is happening in the new Energy Risk Profile?

The frontiers of the new Energy Industry

- **Technology**

- High Pressure, High Temperature (HP/HT) reservoirs
 - Borehole conditions in excess of 690 barg /150 °C, even up to 1,380 barg / 200 °C
 - Improvements in well design, casing strength, sealing compounds, stimulation fluids
 - Market size for these wells is small relative to conventional, but growing....
- Deep water (> 1,000 ft water) exploration and production
 - Most challenging and capital intensive reservoirs yet exploited
 - Improvements in sub-salt imaging, drilling tool reliability, rotary steerable drilling
 - Gulf of Mexico, Brazil and Angola/Congo are the major reserve locations
- Refinery upgrading ('bottom of the barrel')
 - Newer processes and catalysts to convert low value Fuel Oil to high value Motor Fuels
 - Employs higher temperatures, pressures, erosive conditions and complex machines
 - Delayed coking, bitumen sand upgrading, multi-stage hydrocracking
- Information Technology
 - Cyber security – increased reliability on complex control systems; vulnerable to attack
 - Speed of communications – social media and internet news sources spread information immediately on a global forum, challenging traditional public relations strategies

So what is happening in the new Energy Risk Profile?

The frontiers of the new Energy Industry

- **Size**

- 20 years ago a major project was USD 1 billion; today its USD 10 billion
- A ‘world-scale’ project is now in excess of USD 30 billion
 - Gladstone LNG (Santos + 3 others) - USD 30 billion
 - Kearl Oil Sands (ExxonMobil) - USD 33 billion
 - Wheatstone LNG (Chevron + 5 others) - USD 37 billion
 - Bovanenkovskoye (Gazprom) - USD 41 billion
 - Ichthys (INPEX & Total) - USD 43 billion
 - Gorgon (Chevron, XOM, Shell) - USD 57 billion
 - Kashagan (KazMunayGas + 6 others) - **USD 116 billion**



So what is happening in the new Energy Risk Profile?

The frontiers of the new Energy Industry

- **Pace / Volatility**

- ‘Disruptions’ to the industry (positive and negative) are becoming more frequent, higher impact and are arriving at a faster pace than ever before
 - Shale oil/gas technology – sustained reduction in global gas prices; change in supply/demand balances in key economies (e.g. USA)
 - Onshore wells are being drilled in half the time and are four times more productive than they were a decade ago
 - Geographical shift for manufacturing locations
 - New, efficient refining and petrochemical capacity in India, China and Middle East; forcing the shutdown of older assets, particularly European sites
 - Market dynamics are more uncertain, prices tend to move more severely
 - Huge demand growth in developing economies, but increasingly dependent on global sentiment
 - Price swings can bankrupt a company within one business cycle
 - In 2008, the oil price (WTI) went from 80 \$/bbl to 147 \$/bbl to 38 \$/bbl in space of eight months
 - Energy efficiency improvements could reduce energy usage by 25-40%, even with global population and living standards increases
 - Environmental regulations are tightening, presents ever increasing technical challenges and massive capital investment for zero return (‘remain in operation’ scenario)

External Risks pose a significant threat to the Energy Industry

Global risks with high potential impacts

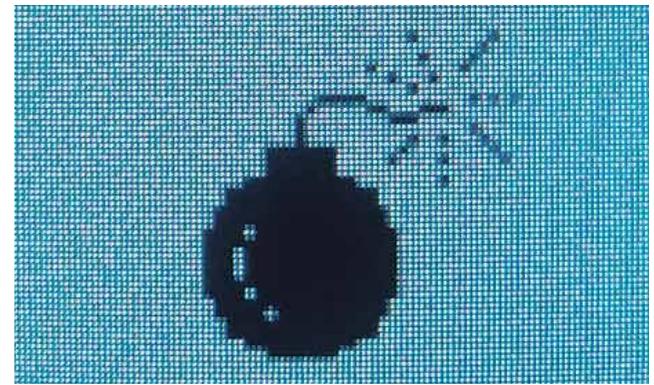
- Fiscal crises in key economies
 - Demand projection uncertainty has a major impact on the allocation of capital for new projects and for the maintenance/revamp of aging assets
- Structurally high unemployment/underemployment
 - New investments in developing economies come with requirements to nationalize the workforce; skills shortage is a significant operational risk
- Greater incidence of extreme weather events
 - Particularly of significance for offshore/coastal installations e.g. GOM, North Sea, South China Sea, etc



External Risks pose a significant threat to the Energy Industry

Global risks with high potential impacts

- Digital disintegration
 - Direct attacks on control systems, particularly cross-country networks; or indirect disruption due to hackers gaining ‘runway’ advantage thereby destroying the integrity of the internet as a trusted platform for commerce and communication
- Water scarcity
 - Major impact on proliferation of hydraulic fracturing; already reported to be impeding shale oil/gas exploitation in China; while world population grew four-fold in the 20th century, freshwater usage grew nine times.
- Profound political and social instability
 - Energy installations, particularly distribution systems, are frequently seen as ‘high value’ targets in unstable countries e.g. Yemen



Risk is at the heart of the Energy Industry

- Risk management has evolved as a key function within Energy companies
- Energy companies have been at the forefront of developing Enterprise Risk Management (ERM) processes
- And the insurance industry has grown as an important risk partner to the energy industry through specialist capacity providers... and highly focused insurance brokers and advisers



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