

## Energy Business – Why this field is tailor-made for Technical Engineering Insurance Underwriters

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IMIA Annual Conference – Mérida, Mexico  
30<sup>th</sup> September 2015

helvetia



1. Engineering Lines Underwriter
2. Overview of Energy Business
  - Upstream
  - Midstream
  - Downstream
3. Underwriting Energy Risks
  - Exposures – Identification and understanding
  - Loss control, prevention and mitigation measures
  - Losses Case Studies
  - MPL assessment
4. Conclusion – Engineering Lines Underwriter revisited....

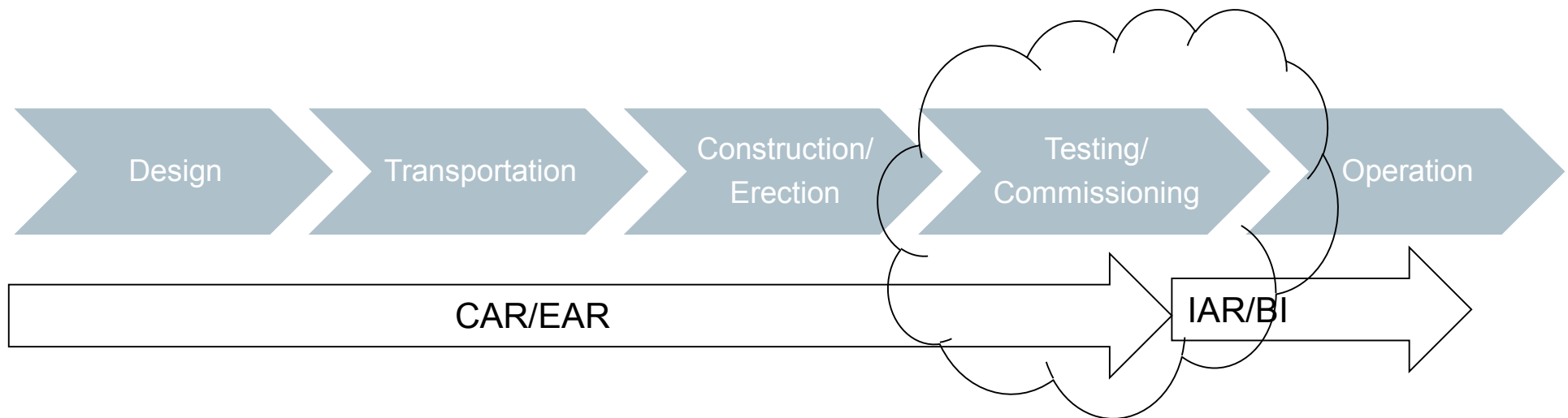
# 1. Engineering Lines Underwriter

## - Required skills

# 1. Engineering Lines Underwriter – Required Skills

Engineering Lines (traditionally):

- Erection All Risk, Construction All Risk
- Machinery Breakdown
- Associated financial covers – ALOP/DSU/MLOP



# 1. Engineering Lines Underwriter – Required Skills

## Engineering Underwriter skills requirements:

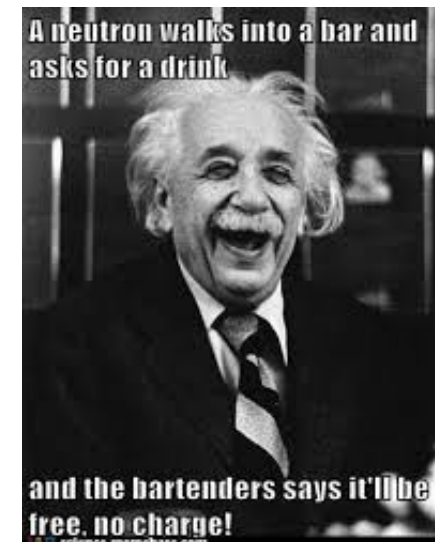
1. Sound technical understanding of the underlying technology or construction techniques
2. Ability to evaluate technical exposures and how these are mitigated/managed
3. Appreciation of industry and loss trends
4. Coupling of technical knowledge with insurance knowledge to design/evaluate coverage
5. Risk selection based on Engineering arbitrage



Civil Engineer



Mechanical Engineer

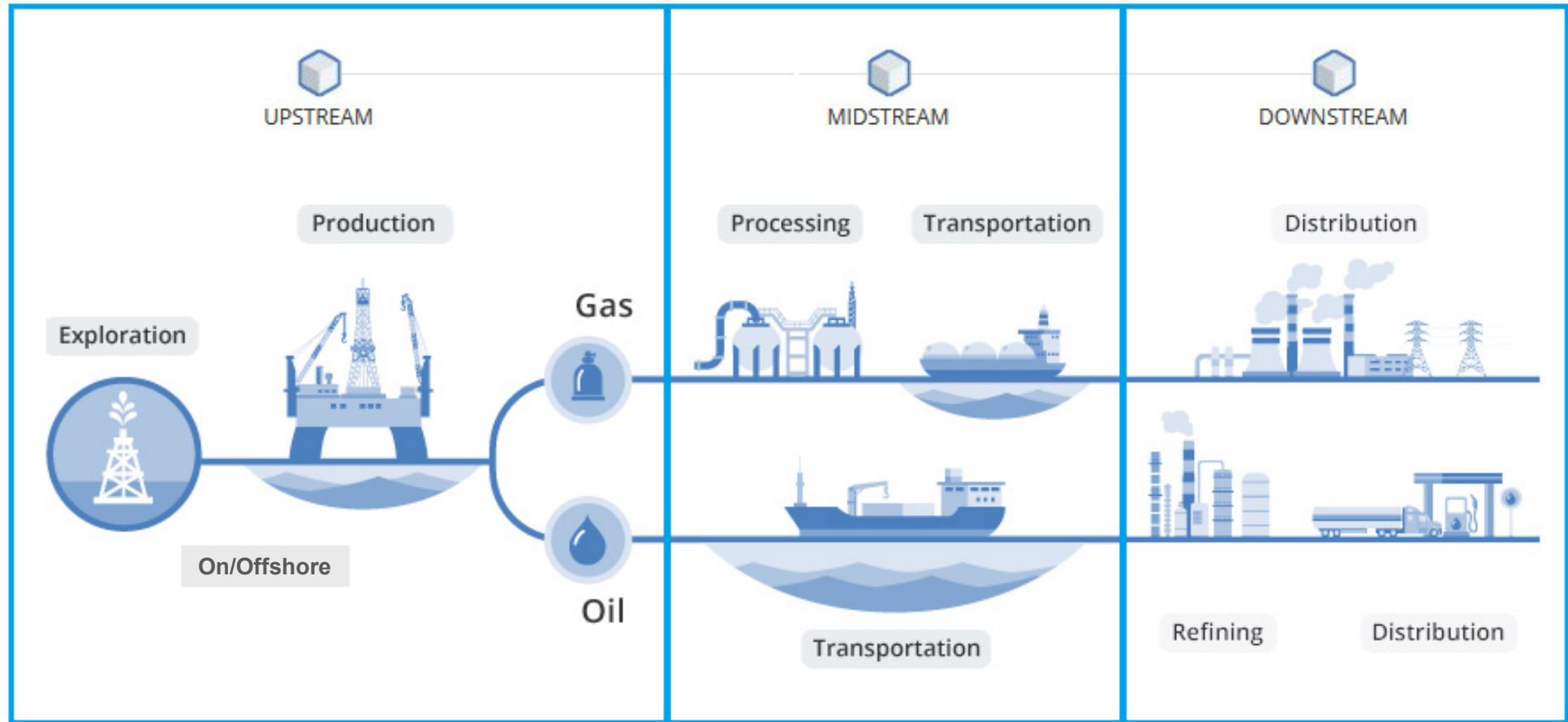


Electrical Engineer

## 2. Overview of Energy Business

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### Oil & Gas Chain

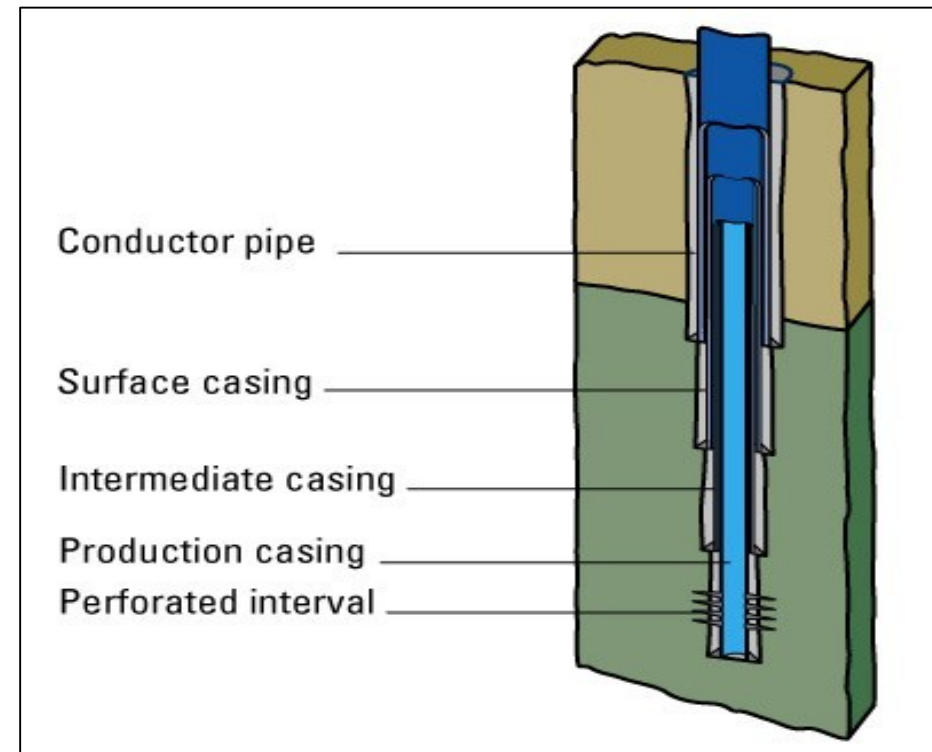
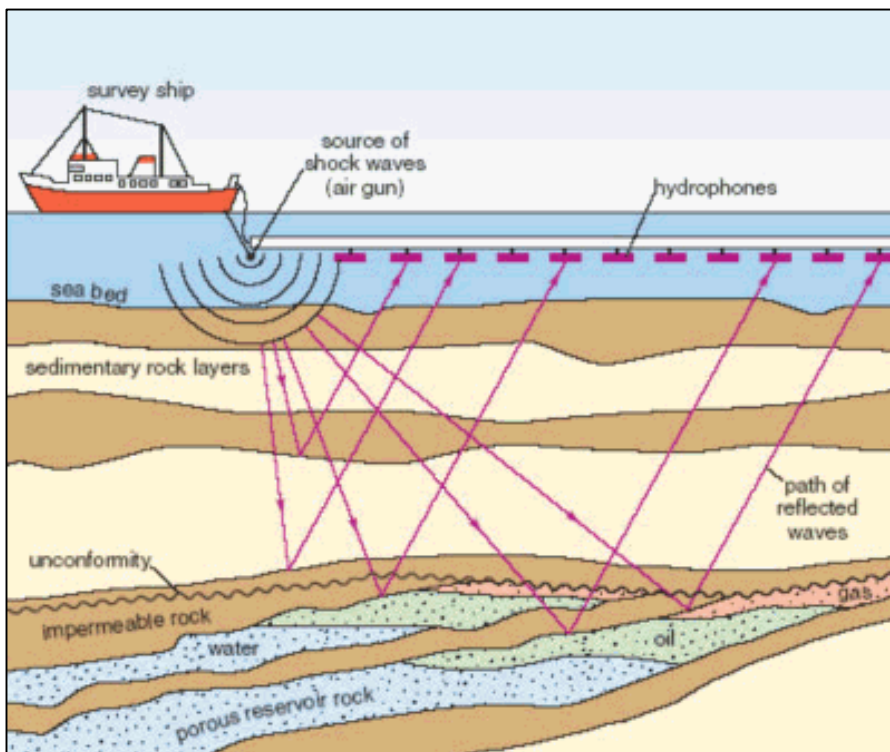


Complexity / Hazards / Engineering Know-how

## 2. Overview of Energy Business UPSTREAM

Basically searching oil/gas fields and drilling (recover and bring the crude oil and/or raw natural gas to the surface).

- Use of advanced techniques to learn about the formations below the earth's surface.
- Geologists/geophysicists can identify the layers and interpret results (hence the resources).
- Well: pipe cemented into a drilled hole through which hydrocarbons can be produced.





# 2. Overview of Energy Business UPSTREAM

Illustrations of a well pads.





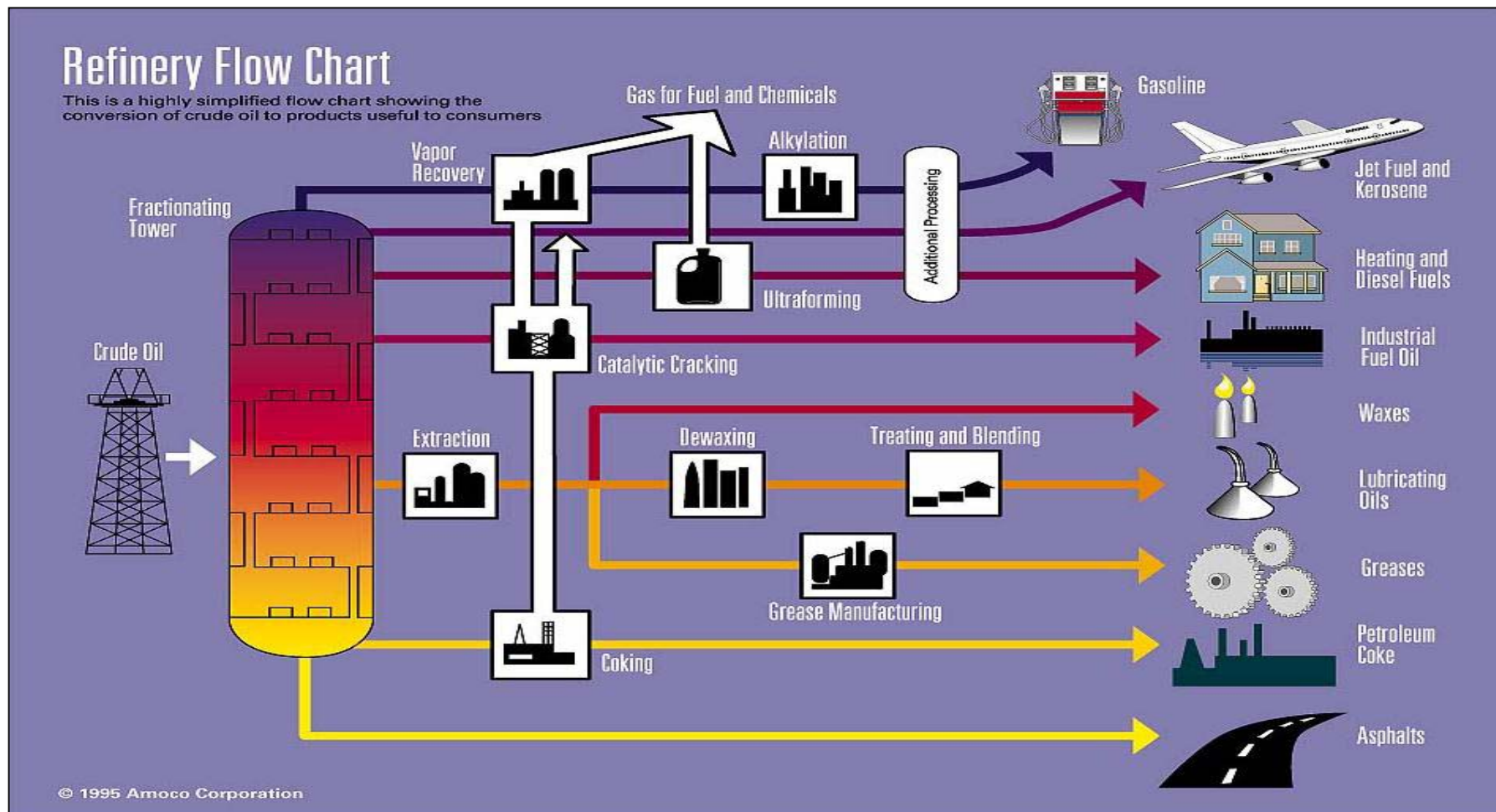
## 2. Overview of Energy Business MIDSTREAM

- Midstream activities include the “processing”, storing, transporting and marketing of oil, natural gas and natural gas liquids.
- Gas Oil Separation Plant: Processes crude oil from the well head/pad
- Separates gases and contaminants
- Makes the crude economically viable for storage, processing and export.



## 2. Overview of Energy Business DOWNSTREAM

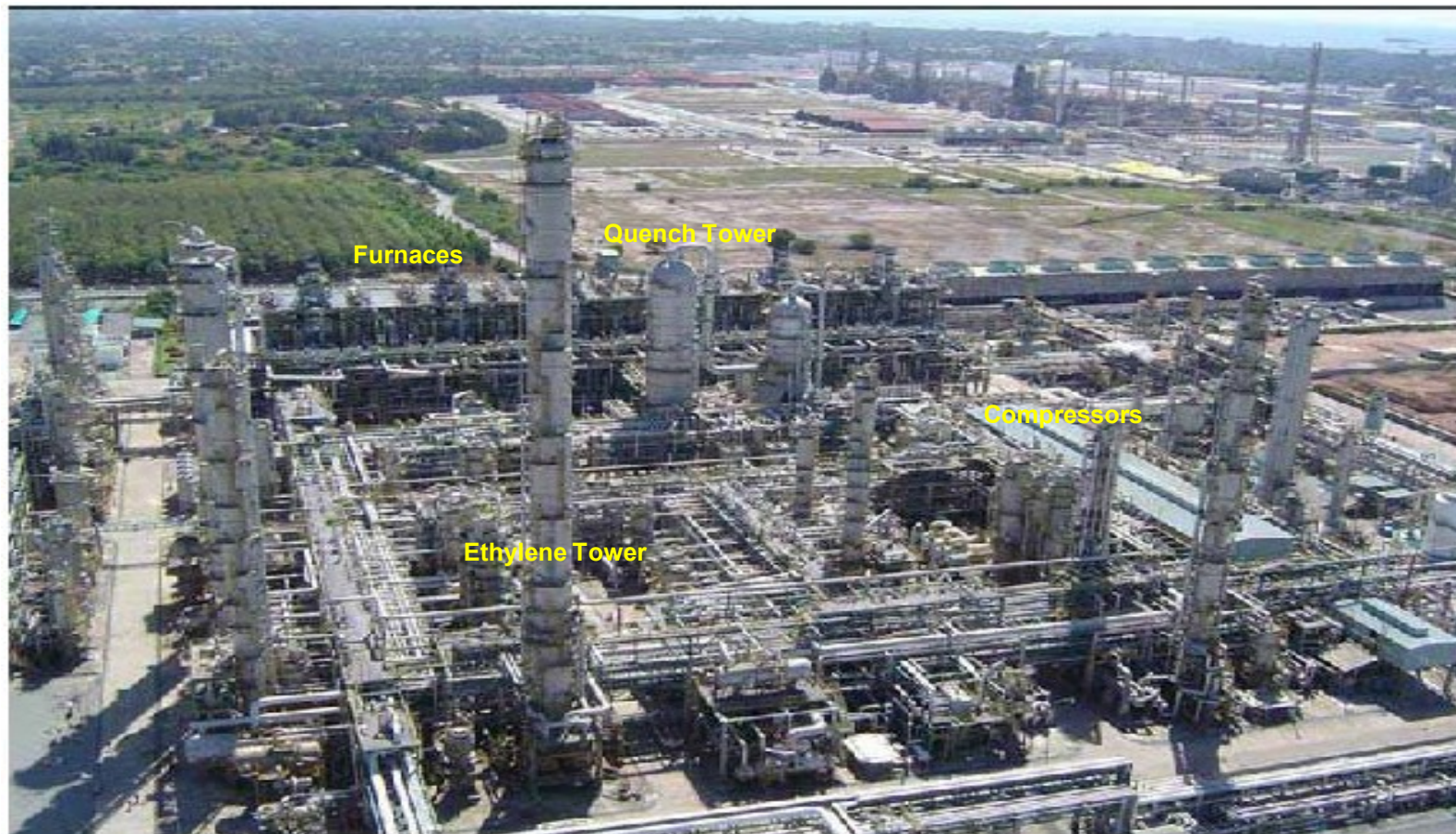
- Refining of crude oil.
- Selling and distribution of natural gas and products: LPG, gasoline, jet fuel, diesel fuel, fuel oils, asphalt and petroleum coke.





## 2. Overview of Energy Business DOWNSTREAM

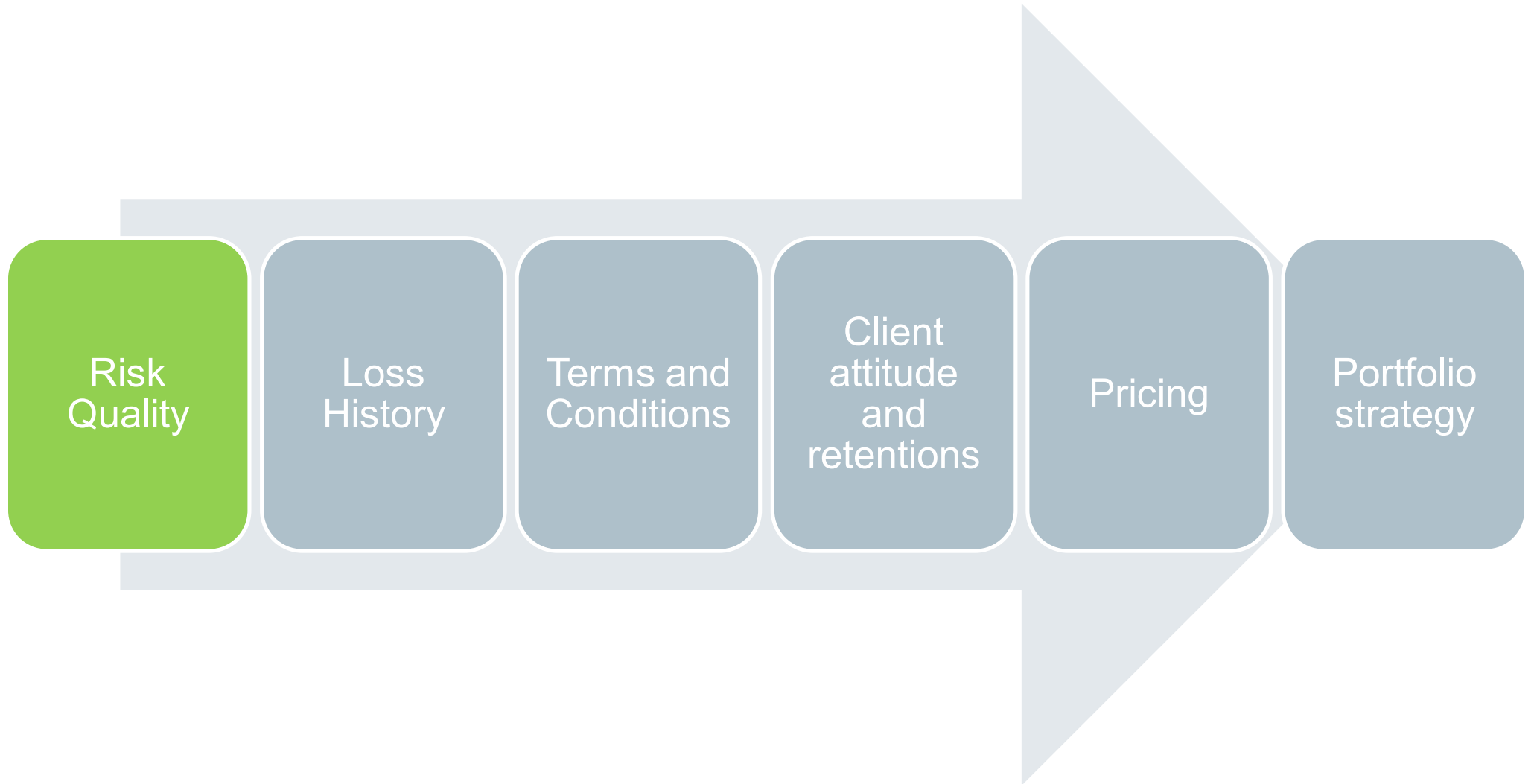
- Ethylene Cracking:
  - To produce polymer-grade ethylene (99.95 vol.%).
  - Major byproducts are propylene (chemical or polymer-grade).
  - Ethylene and Propylene = raw materials for plastic production



### 3. Underwriting Energy Risks

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Risk Selection/Differentiation is Key



### 3. Underwriting Energy Risks

#### Exposures – Identification and understanding UPSTREAM

- Uncontrolled well blow-out scenario.
- Localised fires.
- Machinery Breakdown
- Nat Cat = EQ/Flood (damaging well pad areas/Christmas Trees).





### 3. Underwriting Energy Risks

#### Exposures – Identification and understanding MIDSTREAM

##### – Pipelines & Compression/Pumping stations:

- VCE/Fire.
- Nat Cat = flooding and landslides (tropical areas) associated (or not) with river crossings. Also, earthquake damaging unburied pipelines.
- Machinery Breakdown (+BI) = stand-by units available.
- Nat Cat = EQ/Flood (damaging the Compression/Pumping Station).





### 3. Underwriting Energy Risks

#### Exposures – Identification and understanding MIDSTREAM

– Storage Systems – Atmospheric Storage -  
Tanks Farms:

- Fire – Full Surface Tank.
- Crude Oil Tanks = BOILOVER
- Nat Cat = EQ/Flood.



– Storage Systems – Pressurised Storage (LPG):

- BLEVE (Boiling Liquid Expanding Vapour Explosion).
- Nat Cat = EQ/Flood needs to be considered.



### 3. Underwriting Energy Risks

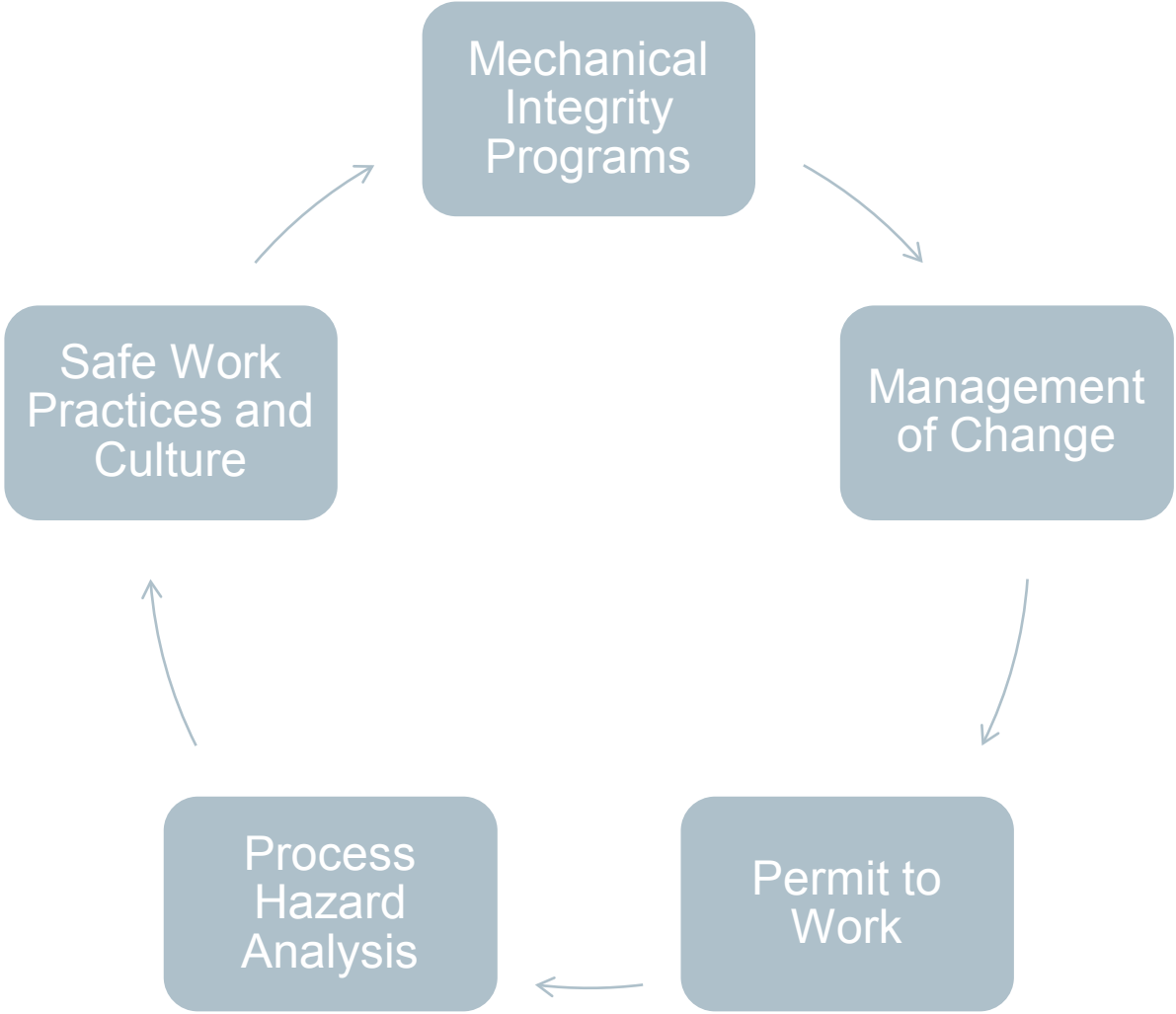
#### Exposures – Identification and understanding DOWNSTREAM

- VCE = Vapour Cloud Explosion
- Fire (several scenarios/locations/units)
- Nat Cat = EQ/Flood needs to be considered.
- Machinery Breakdown (High BI exposure)



### 3. Underwriting Energy Risks

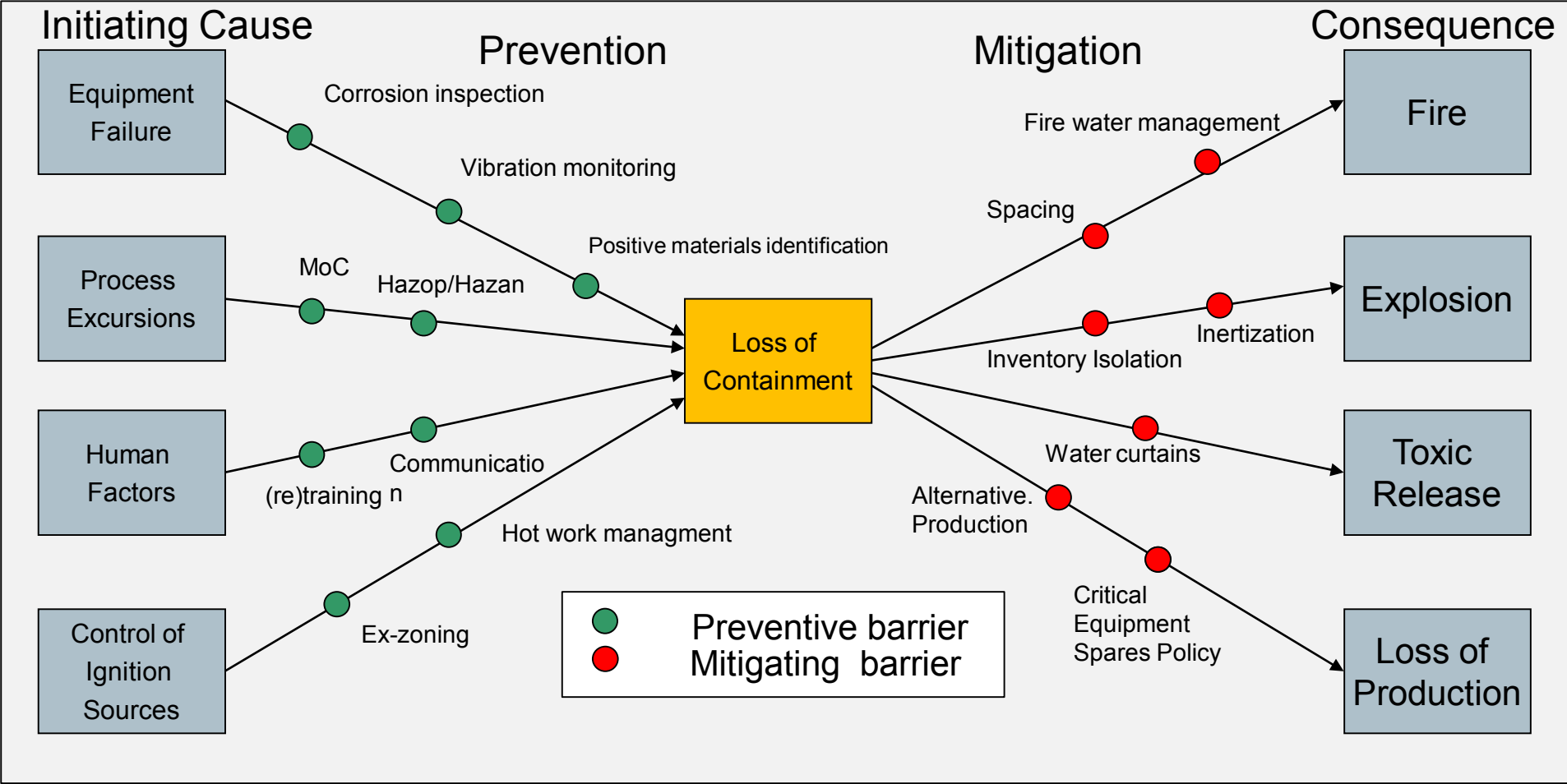
Loss control, prevention and mitigation measures



### 3. Underwriting Energy Risks

#### Loss control, prevention and mitigation measures

Given the inherent fire & explosion hazards of the industry, focus will be on those companies which demonstrate best Process Safety Management (PSM) practices

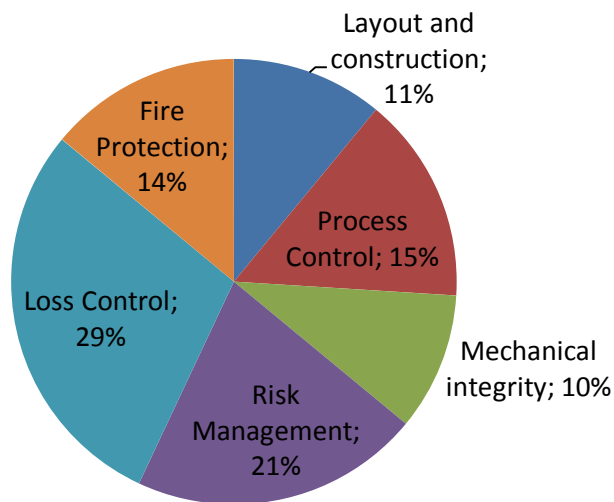


1. Give more credit to prevention than mitigation

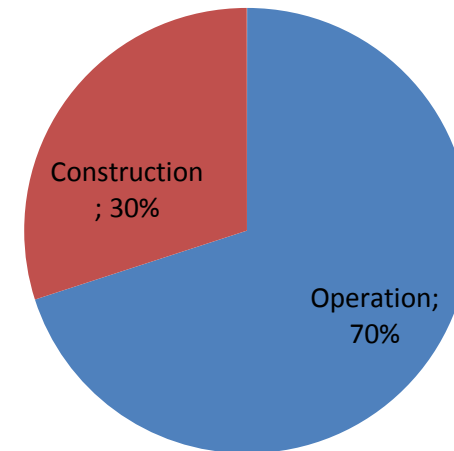
2. Look for multiple barriers

### 3. Underwriting Energy Risks Losses – Case Studies

Study in contributory causes of catastrophic losses in onshore business – Source HSE



Contributory Causes



Operational or Construction issue

Our assessment estimates 30% related to CAR/EAR issues 70% related to operational issues – importance of sound risk management approach once plant is in operation



### 3. Underwriting Energy Risks Losses – Case Studies

#### Humber Refinery – DOL: 16 April 2001:

- Learning - need effective pipework Inspection systems that meet or exceed current industry practice and are based upon full knowledge of past history and current operating conditions.
- Need Management of Change systems that accommodate both plant and process modifications.

Ref: <http://www.hse.gov.uk/comah/conocophillips.pdf>





### 3. Underwriting Energy Risks Losses – Case Studies

#### BP Refinery – DOL: 23 March 2005:

- A redundant high level alarm failed: Inspection/Maintenance.
- Supervisors and operators poorly communicated critical information regarding the startup during the shift turnover: Communication.
- The operator Training program was inadequate.
- Outdated and ineffective Procedures did not address recurring operational problems.

Ref: <http://www.csb.gov/bp-america-refinery-explosion/>



### 3. Underwriting Energy Risks Losses – Case Studies

#### Pasadena – DOL: 23 October 1989:

- Plant Layout: positioning of occupied buildings
- An effective permit to work for both company employees and contractors was not enforced by the company.
- Isolation procedure (LoTo: Log Out Tag Out)
- Others.

Ref.: <http://www.hse.gov.uk/comah/sragtech/casepasadena89.htm>





### 3. Underwriting Energy Risks MPL Assessment

#### **A Definition:**

“....this considers the largest loss that could result from a single incident in the plant. It assumes that the initial incident is so large that the active protection systems are rendered inoperative, and only the passive protection facilities, such as spacing and fireproofing are effective. Loss estimates exclude catastrophic events such as impact by aircraft, which is possible but remain unlikely....”

**Market Insurer**

#### **Important because:**

- Evaluation of maximum exposure to the Insurer
- Used to limit line size / capacity deployment
- Used for pricing purposes
- Insured uses to set loss limits

### 3. Underwriting Energy Risks MPL Assessment

#### ENERGY MPL Assessment

- **Operational Accounts** – in general Vapour Cloud Explosion (VCE) is taken as the MPL for most major downstream risks
- **Construction Projects** – more variety in MPL assessment (particularly offshore projects)
  - Onshore projects with VCE exposure – **some take VCE as MPL, others do not.**

**Helvetia position – conservative approach on Onshore Construction,  
take VCE as the MPL because.....**

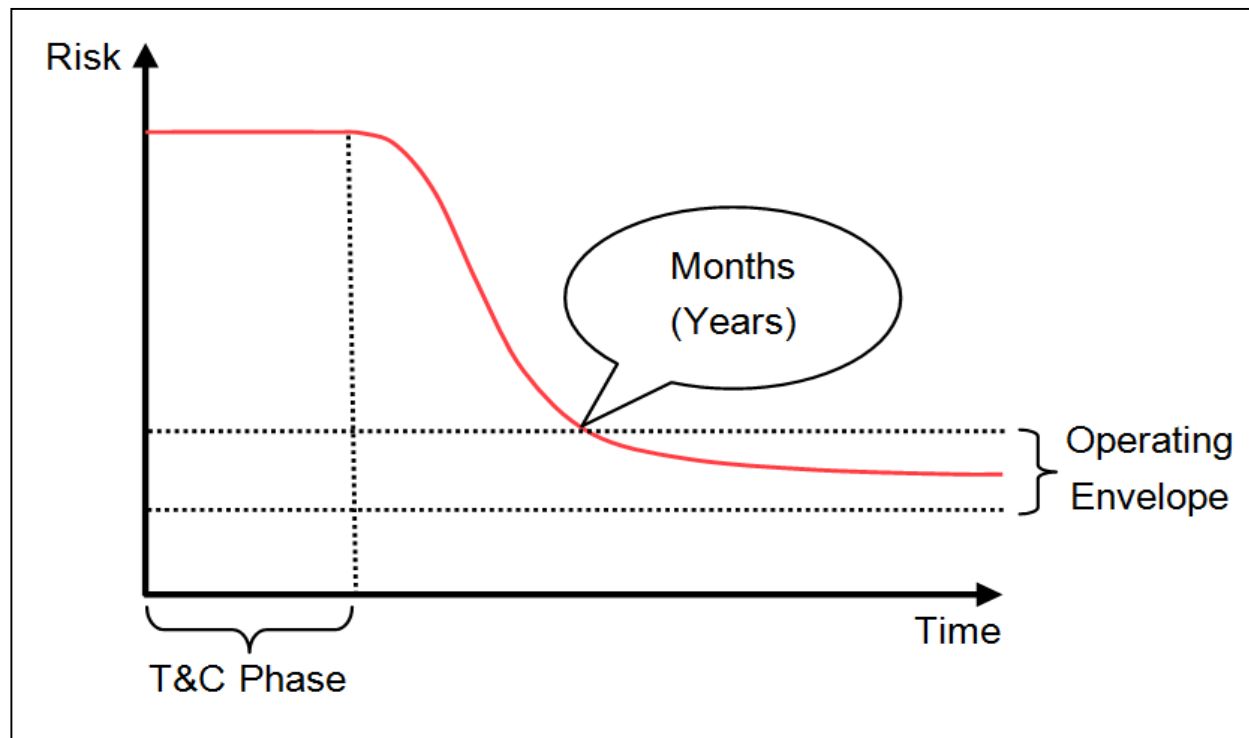
### 3. Underwriting Energy Risks

#### MPL Assessment

#### MPL Scenario for Energy EAR Risk

#### VCE scenario as the MPL:

- The MPL needs to be set at a construction stage when most values are at risk -> during Testing & Commissioning (T&C) phase.
- During T&C: “same” situation as in operation – hydrocarbons present.
- Any start-up is seen as a higher risk period, relative to steady state, and more so with first time operation.

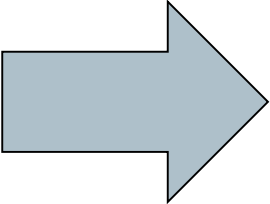


### 3. Underwriting Energy Risks

MPL Assessment  
MPL Scenario for Energy EAR Risk



EAR



IAR



Design & Project Phase  
International Standards  
ISO / IEC  
API / ASME  
ASTM / NFPA  
Local Standards  
Others

In addition...  
PSM & Best Practices (Prevention)  
Mechanical Integrity Programs  
PTW (Permit to Work)  
PHA (Process Hazards Analysis)  
MoC (Management of Change)  
Safe Work Practices & Culture






4. Engineering Lines Underwriter  
- Required skills  
- Revisited.....

### 4. Engineering Lines Underwriter – Required Skills Revisited.....

#### Engineering Underwriter skills requirements:

- 1. Sound technical understanding of the underlying technology or construction techniques
- 2. Ability to evaluate technical exposures and how these are mitigated/managed
- 3. Appreciation of industry and loss trends
- 4. Coupling of technical knowledge with insurance knowledge to design/evaluate coverage
- 5. Risk selection based on Engineering arbitrage

#### Energy Underwriter skills requirements:

- 1. Complex upstream and downstream risks, operational and construction 
- 2. Good understanding of loss control measures such as mechanical integrity, MOC, Permit to Work etc 
- 3. Innovation to optimise profitability on downstream and cutting edge technology for offshore. 
- 4. Bespoke coverages for upstream and downstream risks. 
- 5. Risk selection based on Engineering arbitrage 

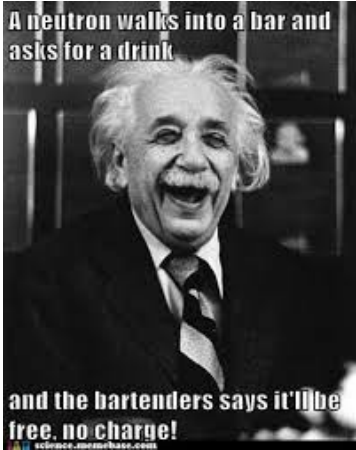
# 4. Engineering Lines Underwriter – Required Skills Revisited.....



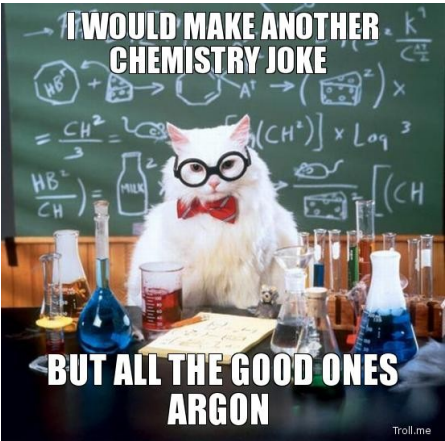
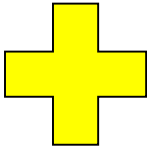
Civil Engineer



Mechanical Engineer



Electrical Engineer



Chemical/Process Engineer



Thank you



Your Swiss Insurer.

