Major Hazard Facility Regulation Around the World

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Overview

- **How did Major Hazard Facility Regulations Evolve?**
- **Hazards are Known yet Accidents Repeat**
- **Review of regulations globally**
- **Safety Case Future**
- **Singapore Safety Case Regime – MHIs**
- **Conclusions**

How did Major Hazard Facility Regulations Evolve?

- **All companies in Oil & Gas industry have similar HSE Policies**
- **We all value the safety of workers as an over-riding concern**
- **Typical message:**

  "Safety is not a cost – it is the way we do business"
- **Some achieve this**
- **Sometimes even the best are caught out ……..**

How did Major Hazard Facility Regulations Evolve?

- Rapid expansion of Chemical Industry after WWII
- Larger, more complex plant
- Operating at higher temperatures and pressures
- Increase in incidents of fires and explosions
- Industry began to respond with better understanding
- Regulators responded with more stringent rules
- In time honoured fashion - the rules were prescriptive

How did Major Hazard Facility Regulations Evolve?

Widely accepted failings of prescription include:

- **Industry lets regulator work out what is needed and comply verbatim – so operator fails to identify or understand the hazards and risks they are supposed to manage – controls may be inadequate or inappropriate**
- **Prescriptive regulations become a hurdle to be cleared, with the focus on the hurdle, not on managing the hazard**

How did Major Hazard Facility Regulations Evolve?

- You've carefully thought out all the angles
- You've done it a thousand times
- It comes naturally to you
- You know what you're doing, it's what you've been trained to do your whole life.
- Nothing could possibly go wrong, right?

Think Again

How did Major Hazard Facility Regulations Evolve?

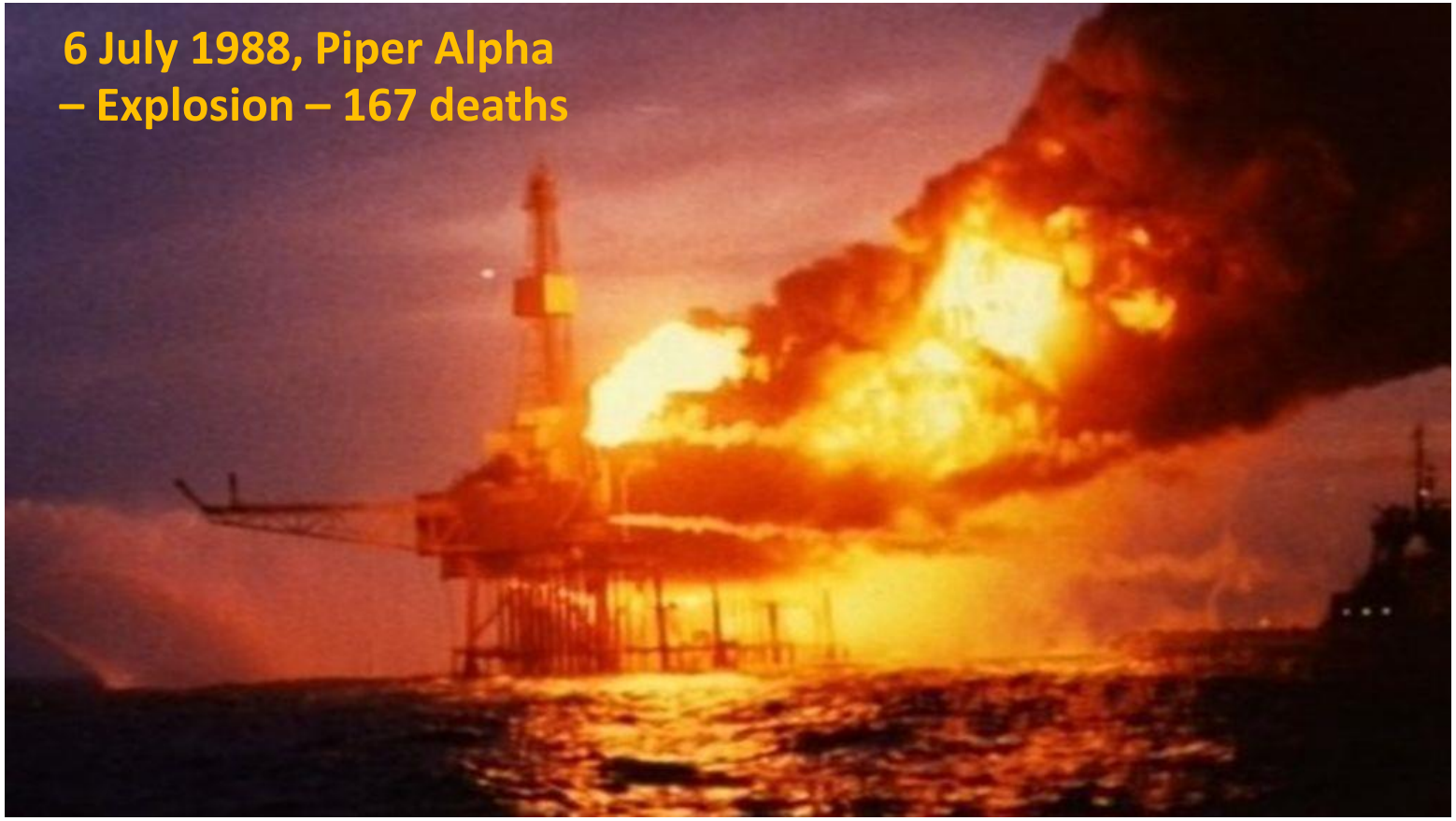
Some examples where hazards were not understood or managed:

- **Flixborough, UK, June 1974**
- **Seveso, Italy, July 1976**
- **Bhopal, India, December 1984**
- **Longford, Australia, September 1998**
- **Texas City, USA, March 2005**

How did Major Hazard Facility Regulations Evolve?

Bhopal, India, December 1984 – estimated up to 15,000 fatalities

How did Major Hazard Facility Regulations Evolve?



How did Major Hazard Facility Regulations Evolve?

- The Texas City Refinery explosion occurred on 23 March, 2005
- A hydrocarbon vapour cloud was ignited and violently exploded at the ISOM isomerization process unit at BP's Texas City refinery in Texas City
- 15 workers died, injuring more than 180 others and severely damaging the refinery.

How did Major Hazard Facility Regulations Evolve?

- In the 10 years prior to Texas City Disaster, at least 64 people were killed at US refineries
- In the 10 years SINCE Texas City Disaster, at least 58 people were killed at US refineries
- Until 2011, contractor deaths were not counted in US government statistics for the refining industry
- So the 15 Texas City fatalities were not counted in 2005!

Ref: Malewitz, J et al, 31 Mar 2015, "A Deadly Industry – Assembled data shows how and where US refinery workers continue to die", https://www.ehstoday.com/safety/deadly-industry

How did Major Hazard Facility Regulations Evolve?

How did Major Hazard Facility Regulations Evolve?

The USA – Lagging behind?

National Commission report recommended:

- ***The Department of the Interior should develop a proactive, risk-based performance approach specific to individual facilities, operations and environments, similar to the "safety case" approach in the North Sea.***

  Macondo National Commission report

- **The report acknowledges this may take several years to implement.**

Hazards are Known yet Accidents Repeat

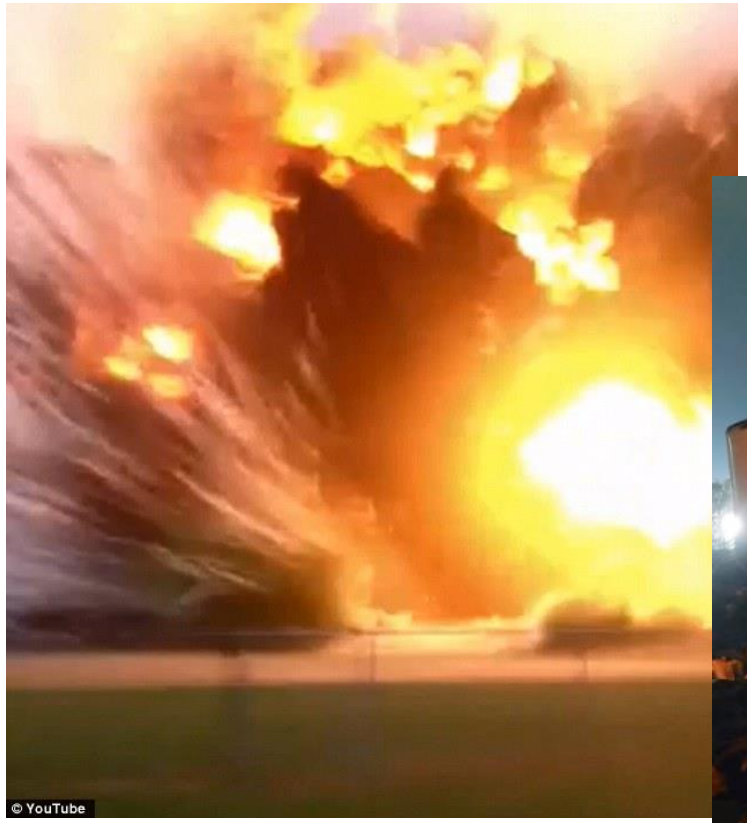
Accidents and incidents continue

- **Accidents always seem to repeat**
- **We know the hazards**
- **We know the controls**
- **But somehow the defenses fail again and again**
- **Is that failure inevitable?**

Hazards are Known yet Accidents Repeat

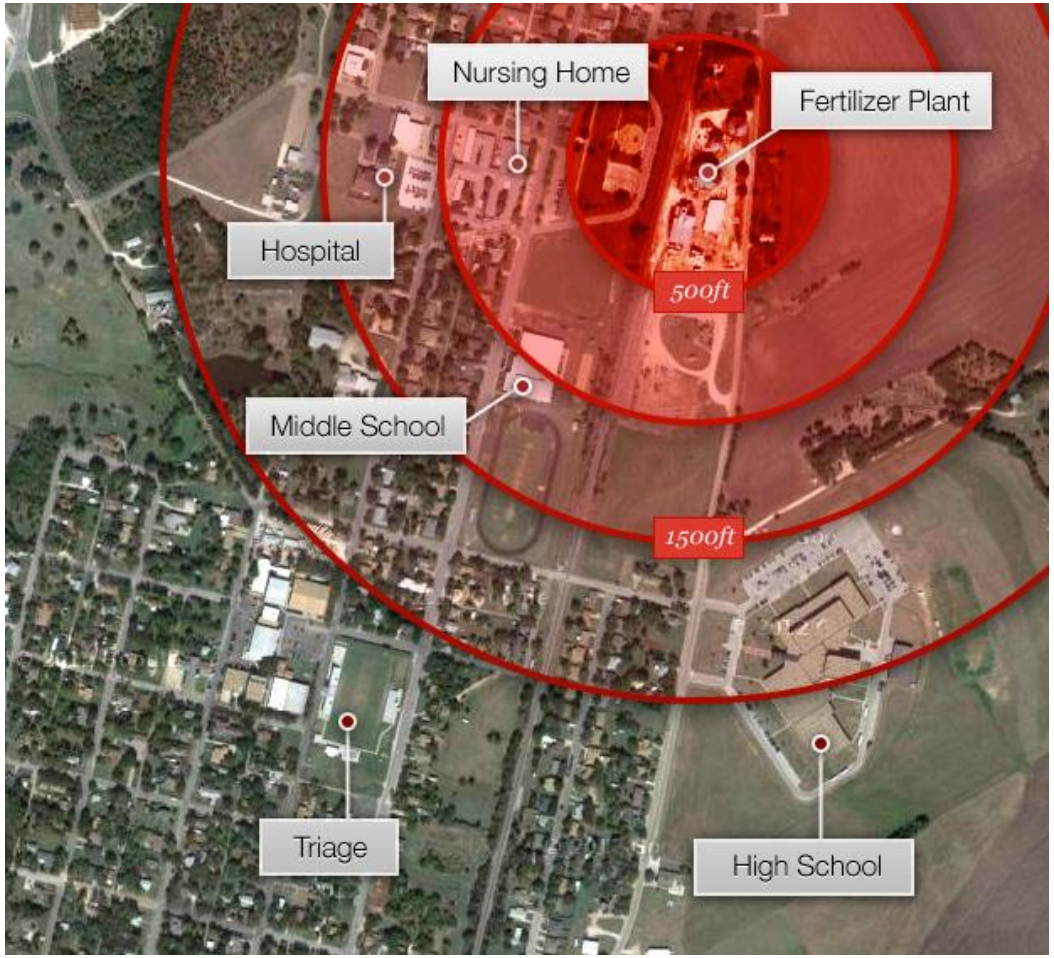
- ***BASF Plant, Oppau 1921 – Ammonium Nitrate & Sulphate Explosion***

Hazards are Known yet Accidents Repeat



- ***West, Texas April 2013 – Ammonium Nitrate Explosion***

Hazards are Known yet Accidents Repeat



- ***West, Texas April 2013 – Ammonium Nitrate Explosion***

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Global Regulation Review

Safety Cases are required in various industries in Europe and Asia.

- **European Union Major Hazard Facilities – Seveso 1 (1982) & Seveso 2 (1996)**
- **Hong Kong – Risk Management of Potentially Hazardous Installations (1987 & various updates)**
- **UK Railways 2000 & amended 2003**
- **European Union Railway Safety Directive (2004/49/EC)**
- **Australia Major Hazard Facilities National Standard 1996 & Updated 2002**
- **New Zealand Health and Safety at Work (Major Hazard Facilities) Regulations (2015)**
- **Singapore Workplace Safety and Health (Major Hazard Installations) Regulations (2017)**

Global Regulation Review

OFFSHORE SAFETY CASE REQUIREMENTS

- **UK Offshore Installations (Safety Case) Regulations 1992 & Updated 2005**
- **Australia Offshore Facilities 1992, 1996, 2005 & 2009**
- **New Zealand Offshore Facilities 1993 & 1999**
- **Timor Leste Offshore Facilities - 2003**

Global Regulation Review

EU Safety Directive June 2013

- EU directive in response to Macondo and other incidents and issues in EU
- Originally proposed regulation was opposed on grounds of complexity, administrative burden and lack of involvement of workforce
- A “regulation” in the EU has direct effect without the need for member states to effect in law
- The final “Directive” is less intrusive but concern remains in all of these areas
- Requires systematic risk management and risk acceptability based on the concept of gross disproportionate cost vs benefit

Countries applying objective-based regulatory regimes

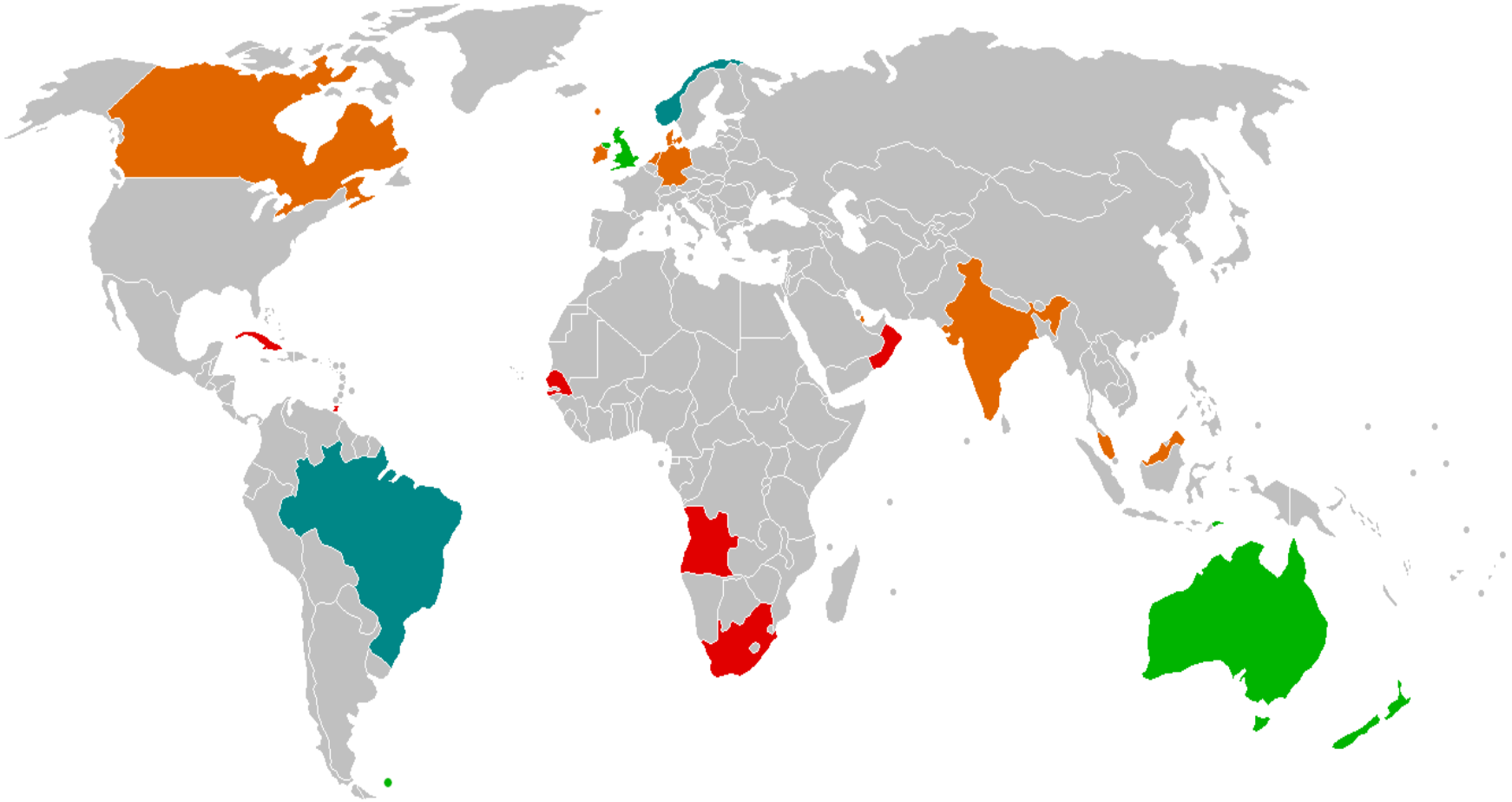
In 2014:

Level 1 – Full Objective based Safety Case

Level 2 – Part Objective, Part Prescription well established and managed

Level 3 – Recently established objective regime

Level 4 – Newly established objective regime, reliant on industry driving safety



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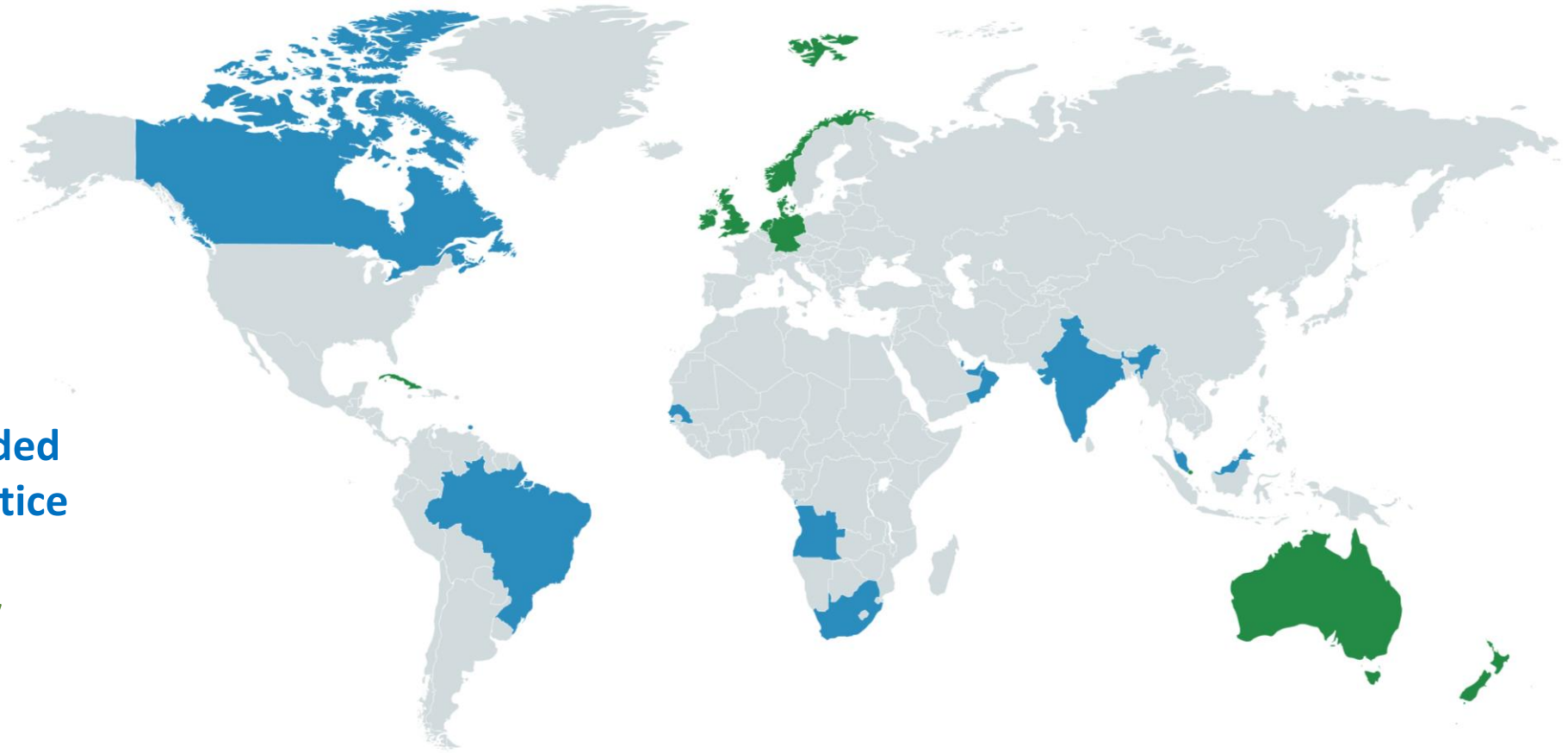
Safety Case - Best Practice vs. Regulation



- **Recommended as Best Practice**
- **Required by Regulation**

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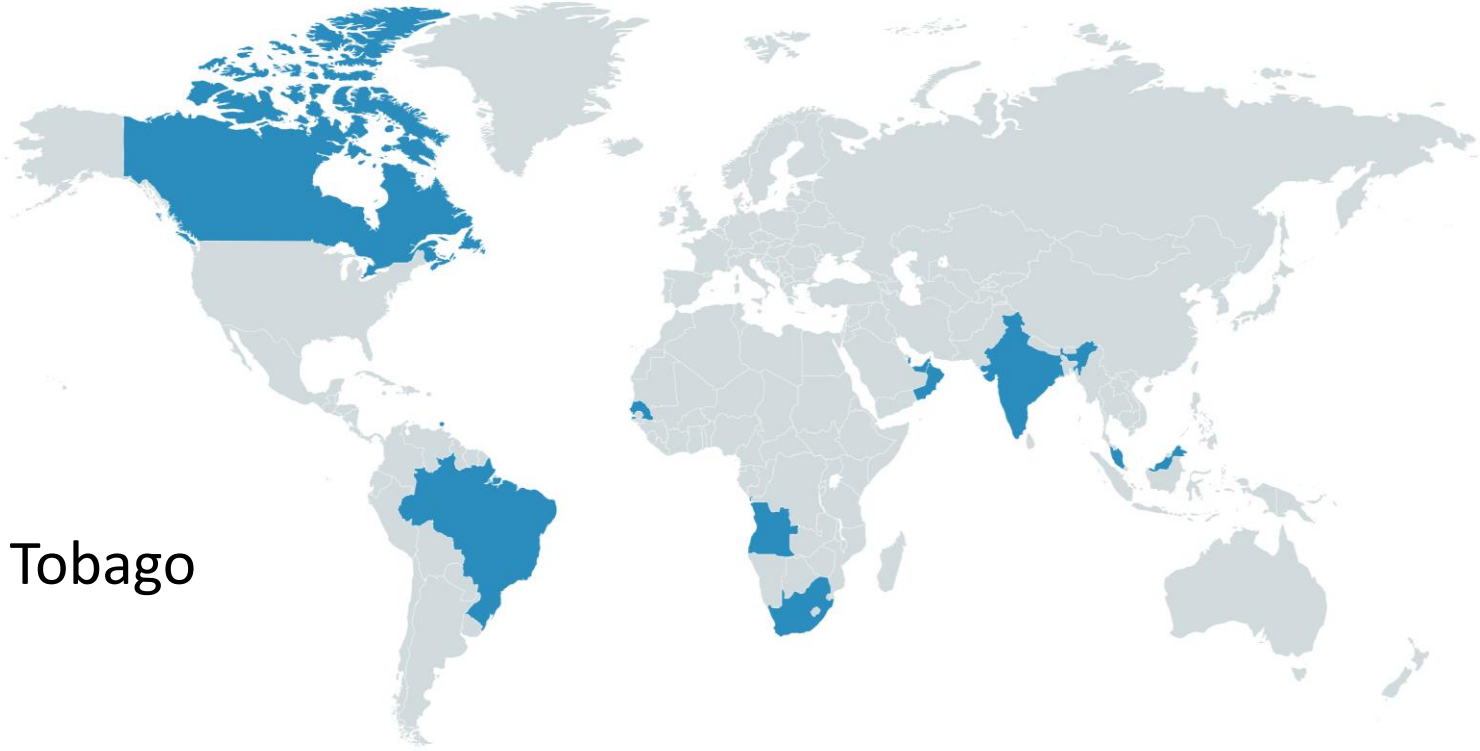
Safety Case (Best Practice)

Countries recommending the offshore Safety Case as best practice:

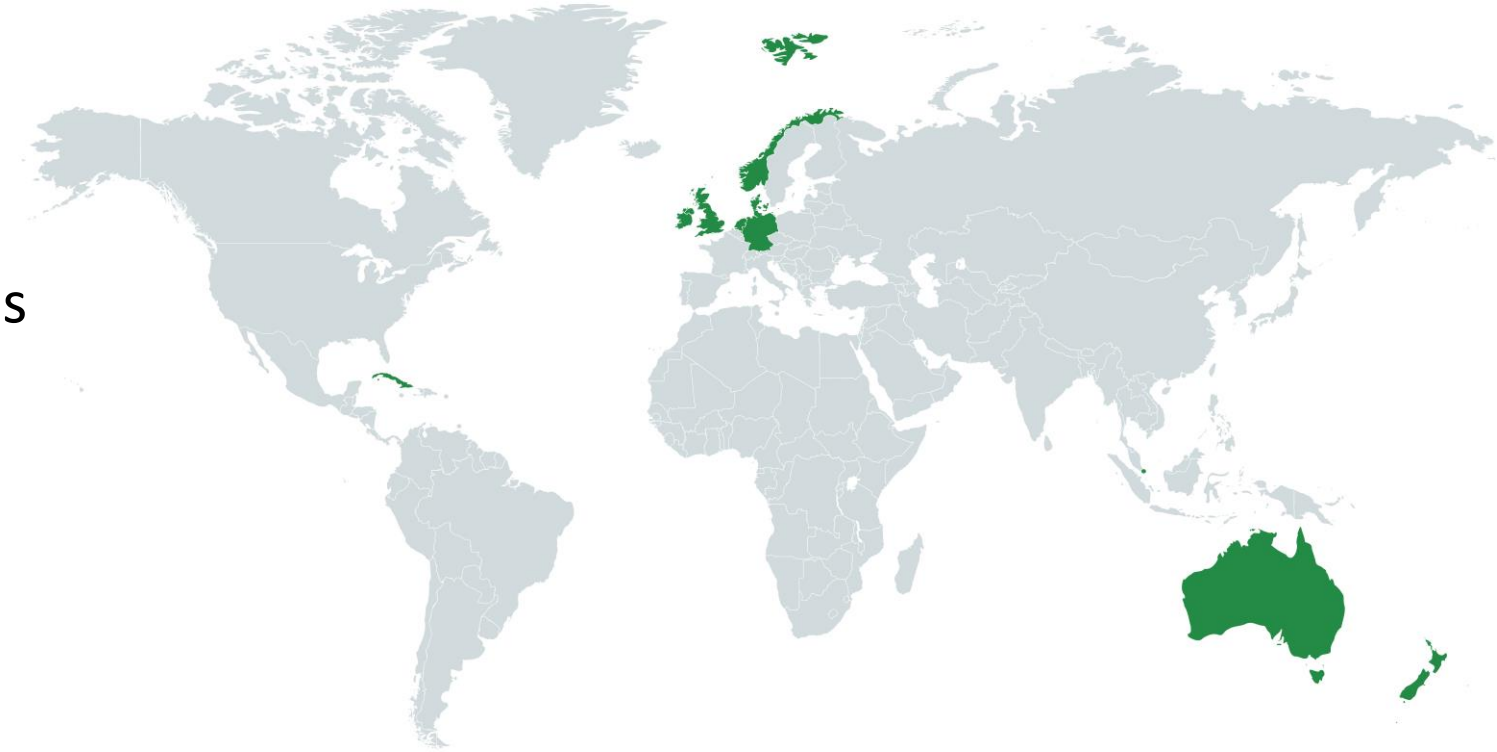
- South Africa
- India
- Malaysia
- Canada
- Brazil
- Angola
- Senegal
- Oman
- Qatar
- Trinidad and Tobago
- UAE



Safety Case (Regulation)

Countries implementing the Safety Case as a regulatory requirement:

- Australia
- New Zealand
- UK
- Ireland
- Norway
- Germany
- Denmark & Faeroe Islands
- Netherlands
- Cuba
- Singapore



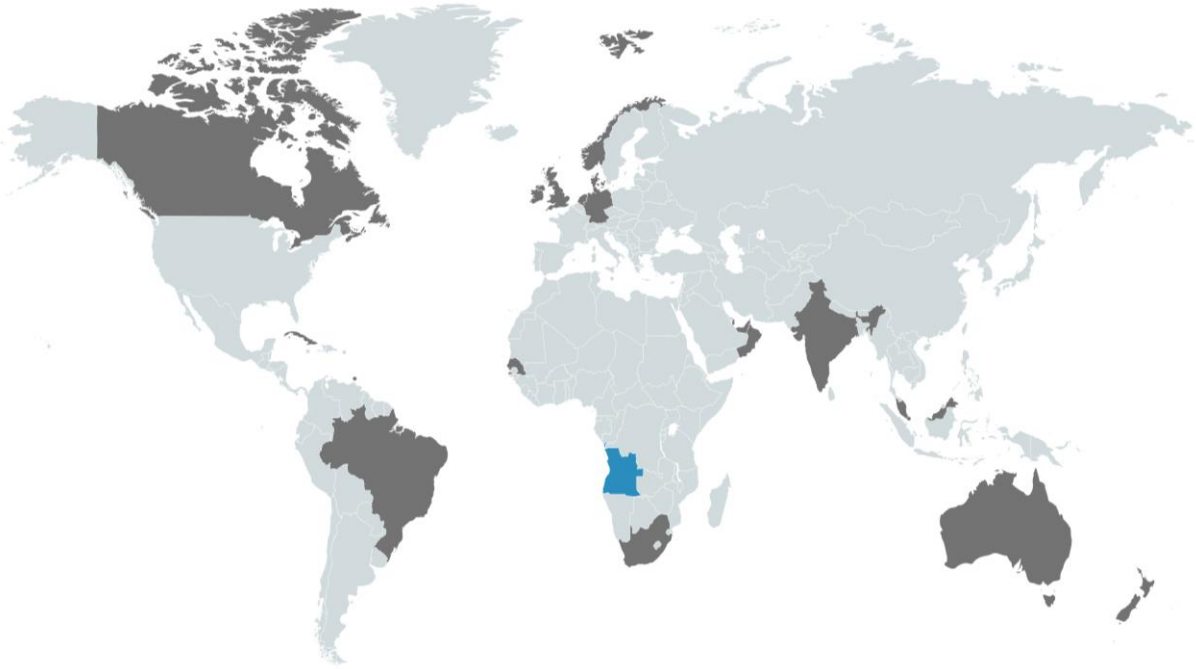
Global Regulation Review - Angola

Angola enacted H&S Regulations for Petroleum Industry in January 2010

- Minimum management system requirements stipulated

Other obligations include:

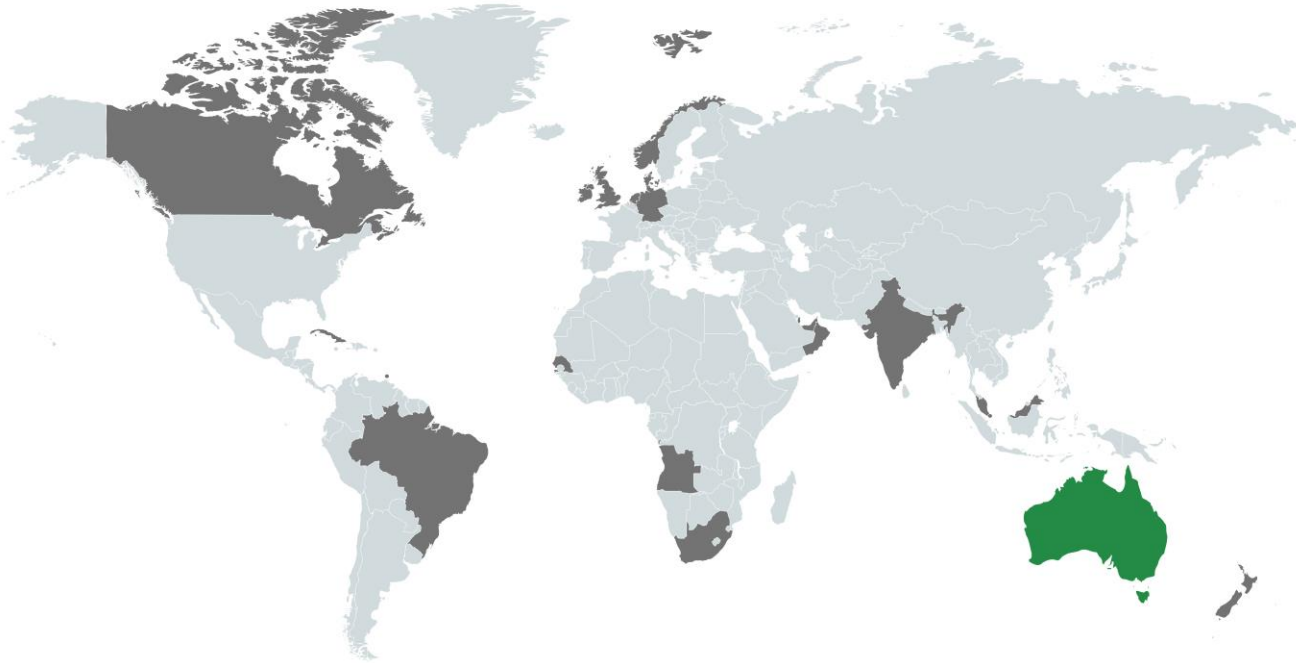
- Qualifications and training
- Risk analysis
- Emergency plans
- Health and safety plans and procedures
- Filing and reporting



Global Regulation Review - Australia

Australia – mature Safety Case regime, similar to UK model.

- MHI Regulations vary from State to State – More uniformity after Longford in 1998
- Offshore Regulations Revised in January 2012 to include Environment under regulatory safety authority
- Multiple Environmental requirements between State and Federal causing confusion



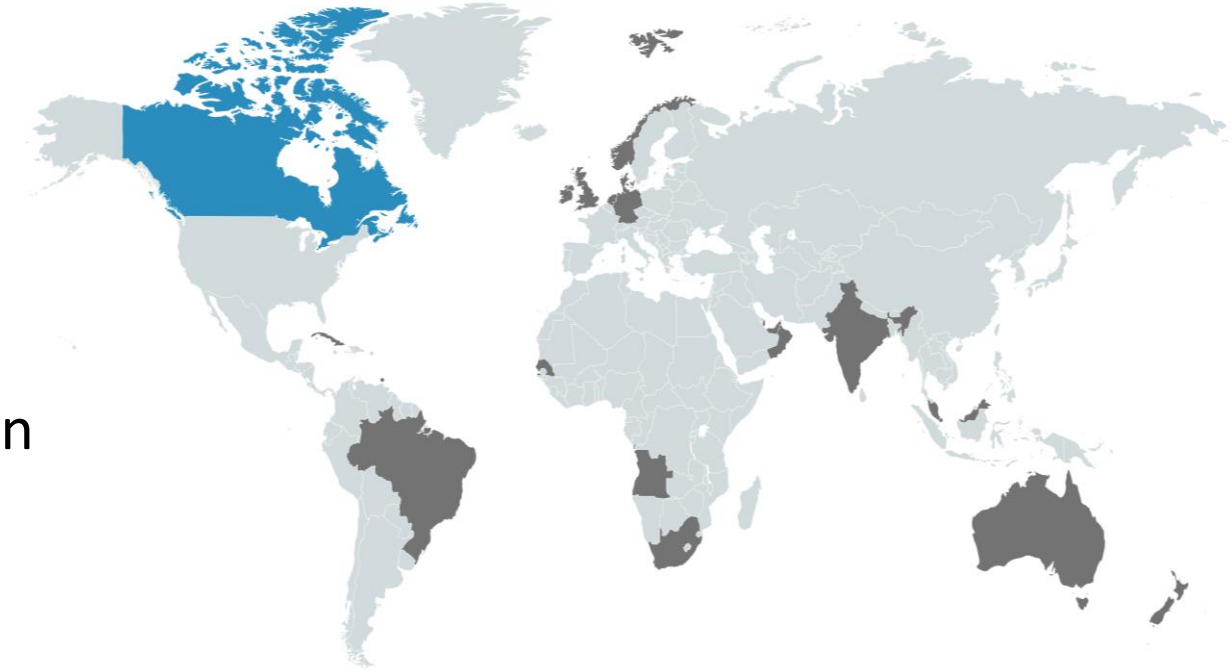
Global Regulation Review - Canada

Canada has a Safety regime (Gazetted in 2009)

- Safety Plan requiring hazard identification & risk based safety management
- Safety Management system with monitoring and continuous improvement loop
- Certificate of fitness required confirming design, construction, installation etc.

Developing Review & Audit Program

- Board inspection, audit and investigation programmes
- Industry self inspections and audits



Standards applied by other bodies

When many countries or companies may be involved:

- World Bank encourages safety cases for major hazard developments that is funded using their resources

- International companies use Safety Case as a minimum requirement, even when working in other countries where it is not implemented
  - Consequence of the Deepwater Horizon Incident

Safety Case – Post-Texas City & Macondo

- Post-Texas City and Macondo (Deepwater Horizon) effects continue to be felt
- Challenges are going to the core of how Major Hazards are regulated
- Recommendations given in a number of countries in the wake of Deepwater Horizon included
  - Develop risk based Safety Case Regime
  - Improve collaboration between Regulator and Industry
- The US CSB suggested Safety Case, however this transition has been resisted
- There has been no formal initiative for Safety Case, ALARP, or rigorous goal setting
- By contrast, Safety Case has been required by the Food and Drug Administration (FDA) for manufacturers of infusion pumps since 2010.
- Those countries & organisations using the Safety Case are challenging to improve it

Major Hazard Installations in Singapore

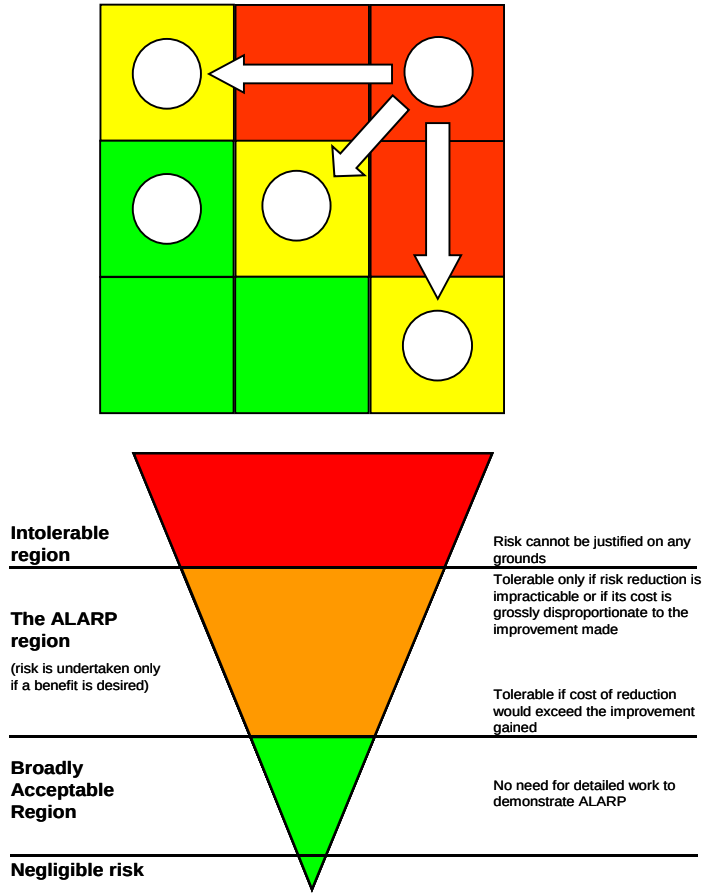
- MHI Regulations introduced under WSH Act to implement the Safety Case Regime in September 2017
- Safety Case reports to consolidate all SHE protocols and demonstrate that SHE Risks are managed to ALARP
- *Must identify all MAHs before performing a sufficient and suitable risk assessment and identify risk reduction measures on identified MASs*
- Demonstrate how SCEs are identified from representative set of MASs
- Attempting proportionality principles for risk assessment applied to ALARP demonstration

Deer Park, Houston – 18 March 2019 - KTRK

MAH = Major Accident Hazard MAS = Major Accident Scenario SCE = Safety Critical Events

Singapore Safety Case - How Does It Value to MHIs?

- **Awareness of hazards to identify all possible MAHs and MASs;**
- **Work together with regulator select a representative set of MASs for detailed assessment**
- **Produce an adequate assessment of severity of consequences for representative set of MASs**
- **Using proper Risk Assessment for realistic estimation of the likelihood of representative set of MAS**
- **Informing Regulator on selected SCEs and justifying subsequent ALARP approach**
- ***Singaporean Safety Case results in a structured way to get to ALARP based on an essential set of SCEs without losing sight in a shear number of MASs that do not add value to selection of SCEs***



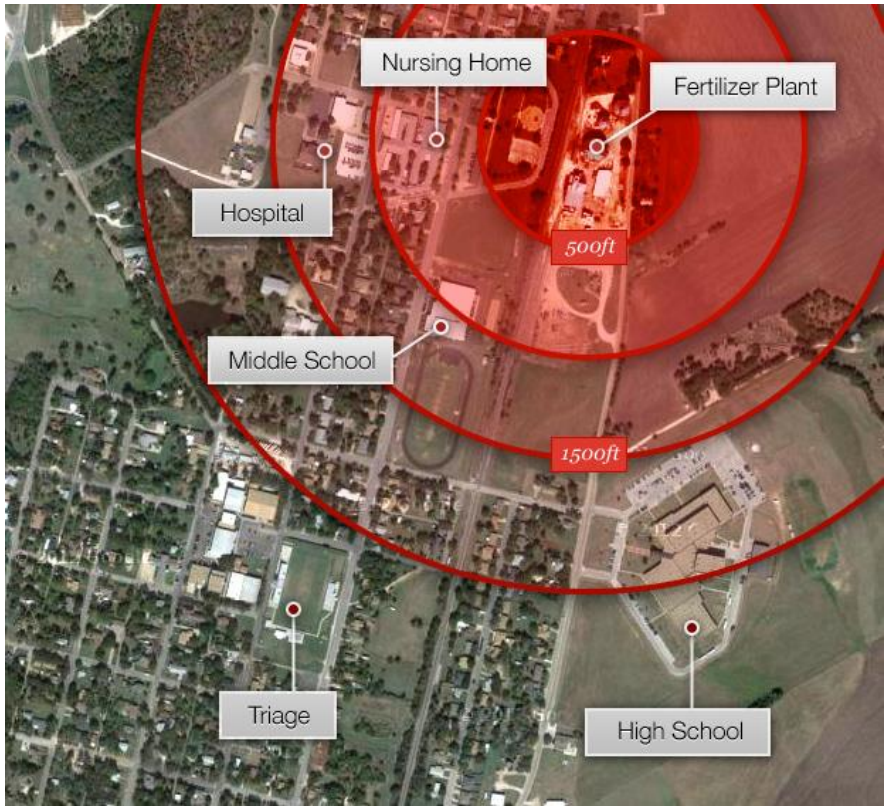
Will we have another Bhopal or Deepwater Horizon?

- *"Those who cannot remember the past are condemned to repeat it"*
  – George Santayana
- Safety regulations are evolving as a result of industrial accidents
- Legislating the changes in the regulations helps to 'encode the memory' of the past incidences into modern industry
- This evolution can be slow, and is subject to the existing cultural and political climates
- Ultimately, Safety Regulations such as Safety Case are upgraded to prevent these events from occurring again

Conclusion

- Safety Regulations are necessary to ensure a minimum standard of assurance for the health and safety of communities and environment
- In the aftermath of Deepwater Horizon, Safety Case regimes came into the spotlight again
- Some countries implemented Safety Case requirement while others made it a recommendation
  - Different standards lead to different results!
- Upgrading Safety Regulations aim to eliminate incidents such as BP Texas City Refinery, etc.
- Potential for Safety Case to expand
  - Cultural pushback led to abandoning Safety Case in USA in 2014/2015
- ***Singapore adopts the Safety Case - MHIs to demonstrate MAH risks are contained within ALARP***

Being Prepared is Everything…



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