Major Hazard Facility Regulation Around the World

Zoran Sekulic, Brendan Fitzgerald, Paul Breen

Vanguard Risk and Safety Asia

Safety Case Symposium 2019
Singapore
Mar 26 - 27, 2019

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?

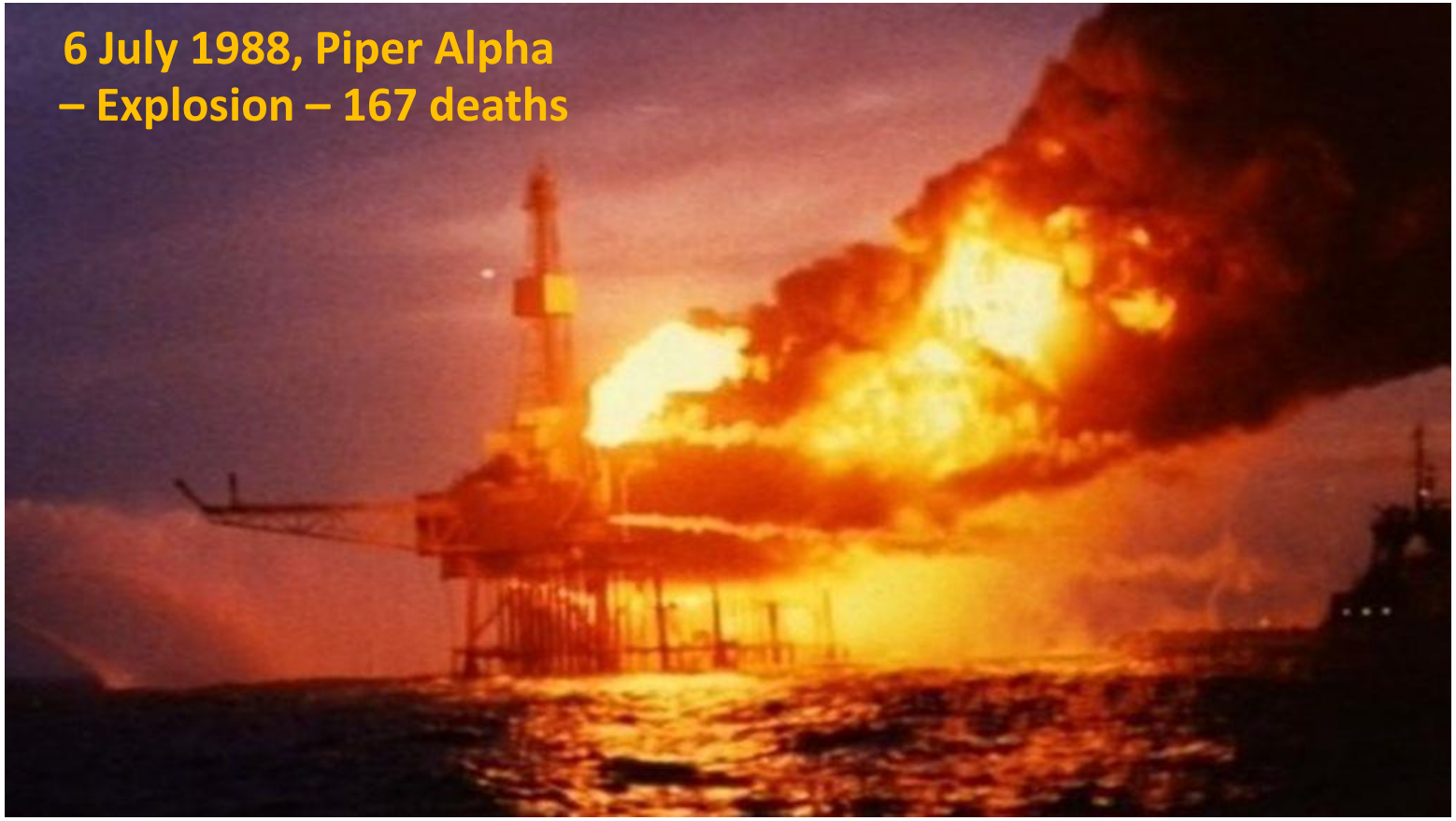
Some examples where hazards were not understood or managed:

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

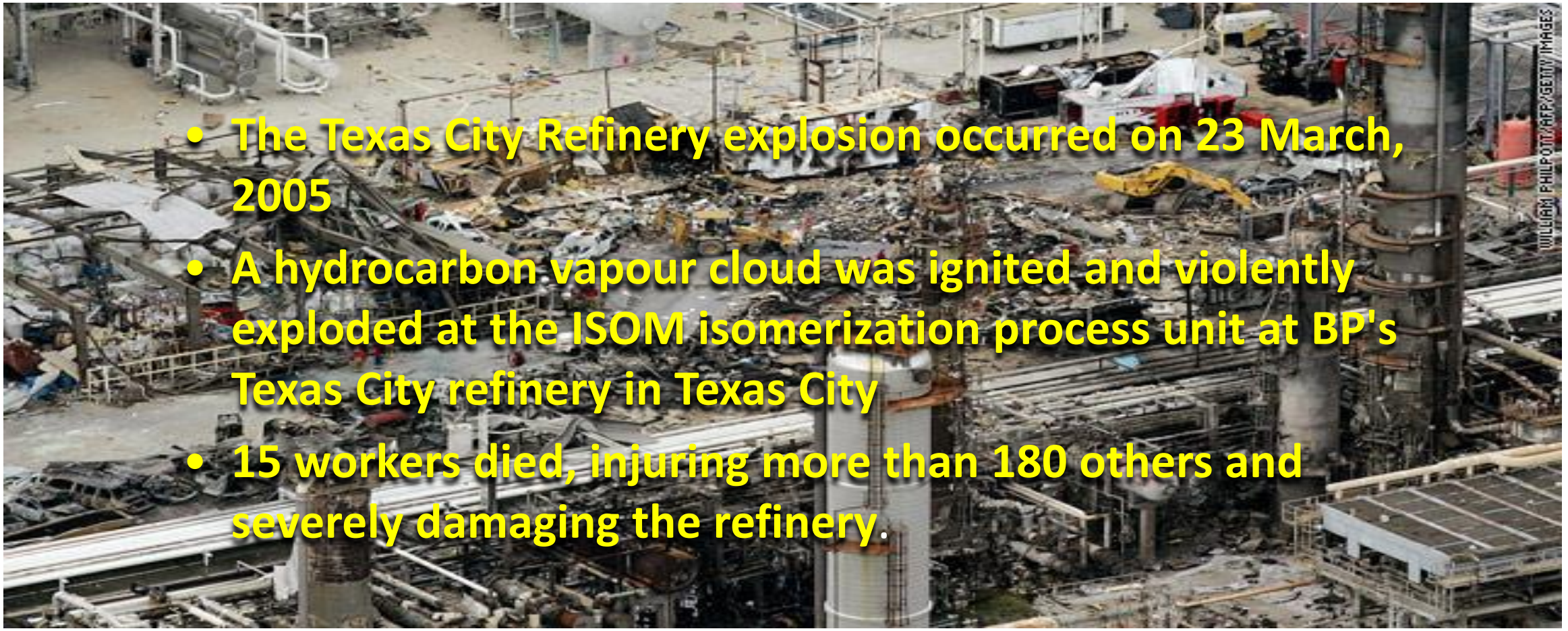
How did Major Hazard Facility Regulations Evolve?

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

How did Major Hazard Facility Regulations Evolve?



How did Major Hazard Facility Regulations Evolve?



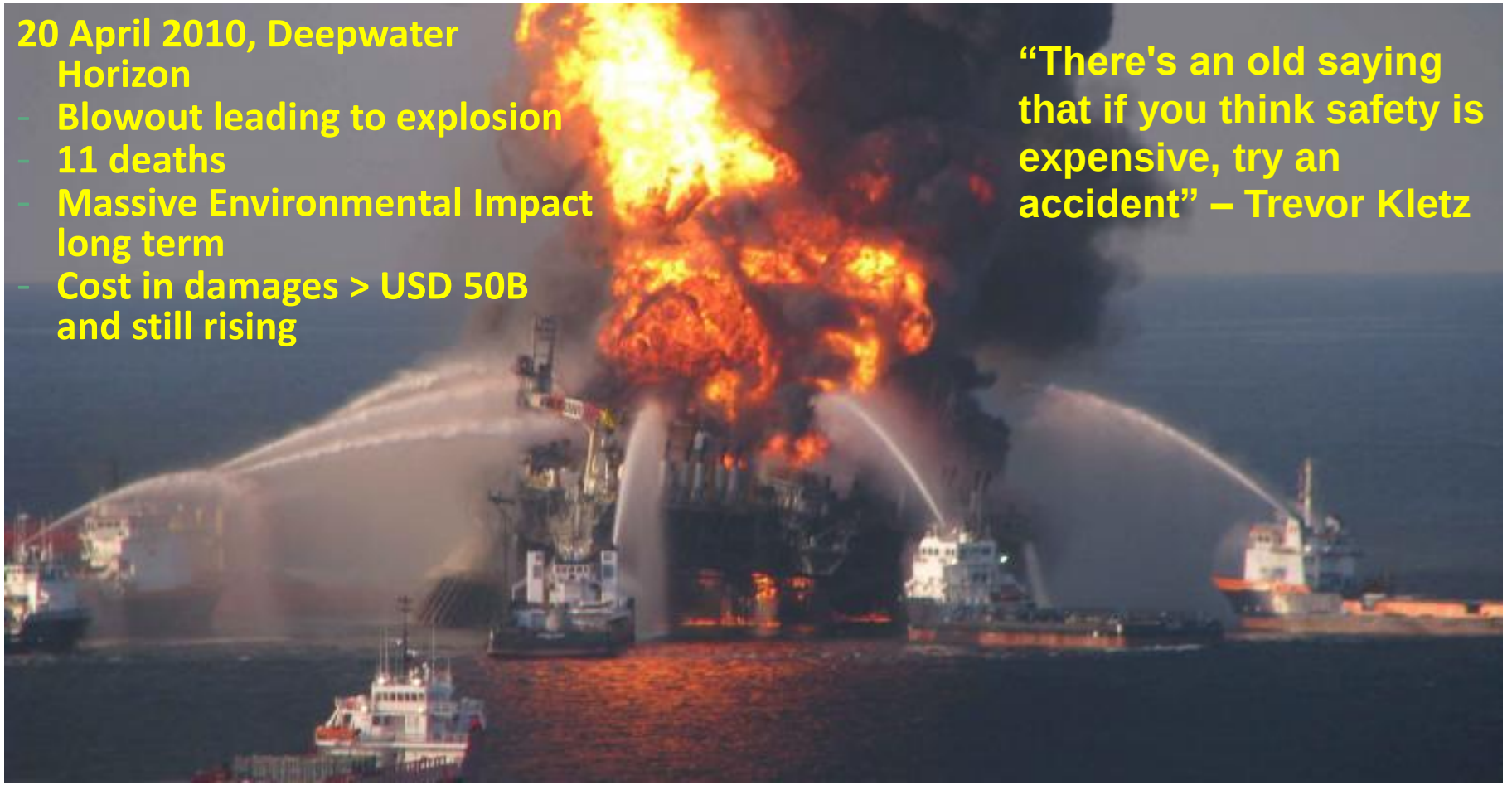
- The Texas City Refinery explosion occurred on 23 March, 2005
- A hydrocarbon vapour cloud was ignited and violently exploded at the ISOM isomerization process unit at BP's Texas City refinery in Texas City
- 15 workers died, injuring more than 180 others and severely damaging the refinery.

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

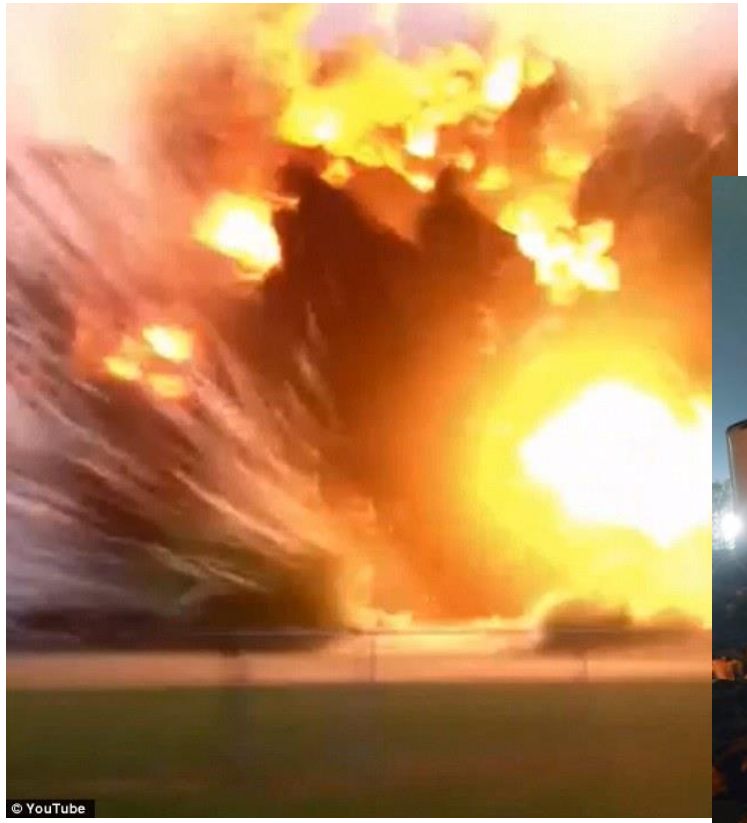
Accidents and incidents continue

- **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

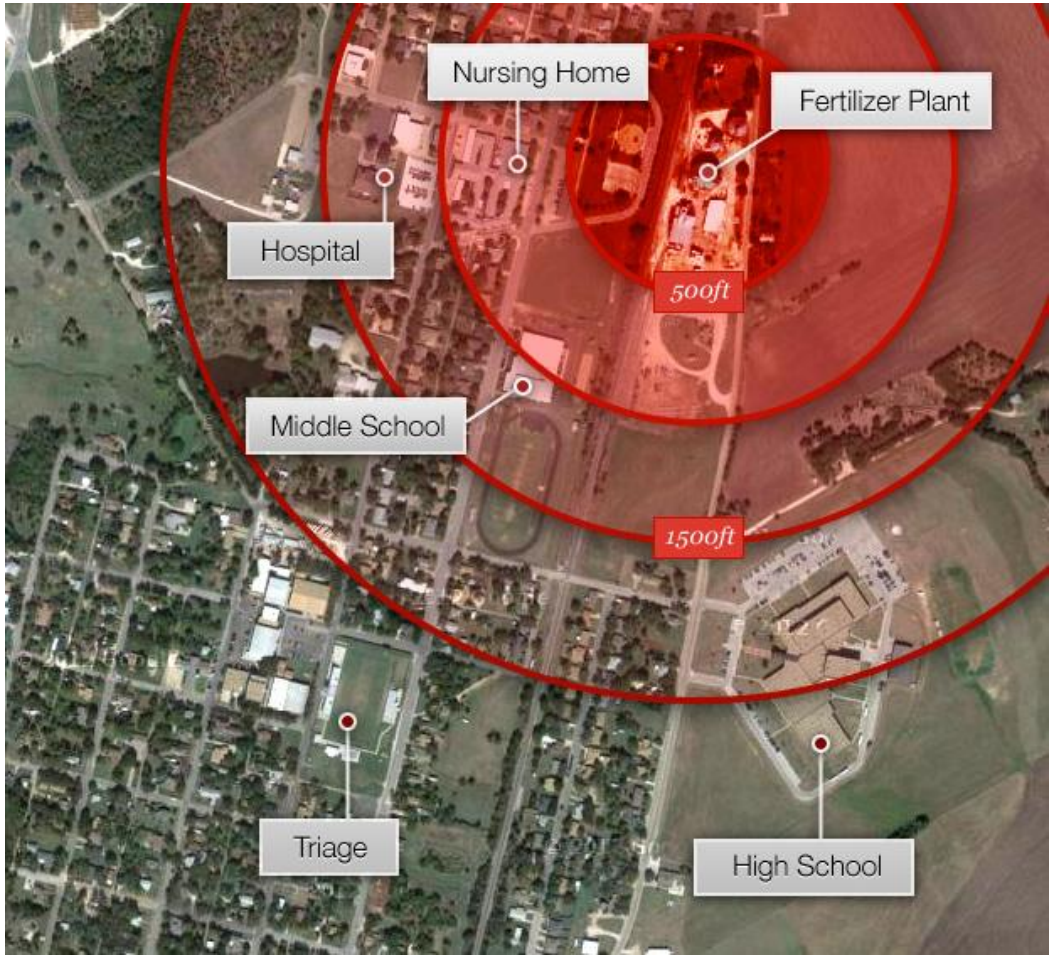
- ***BASF Plant, Oppau 1921 – Ammonium Nitrate & Sulphate Explosion***

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***

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

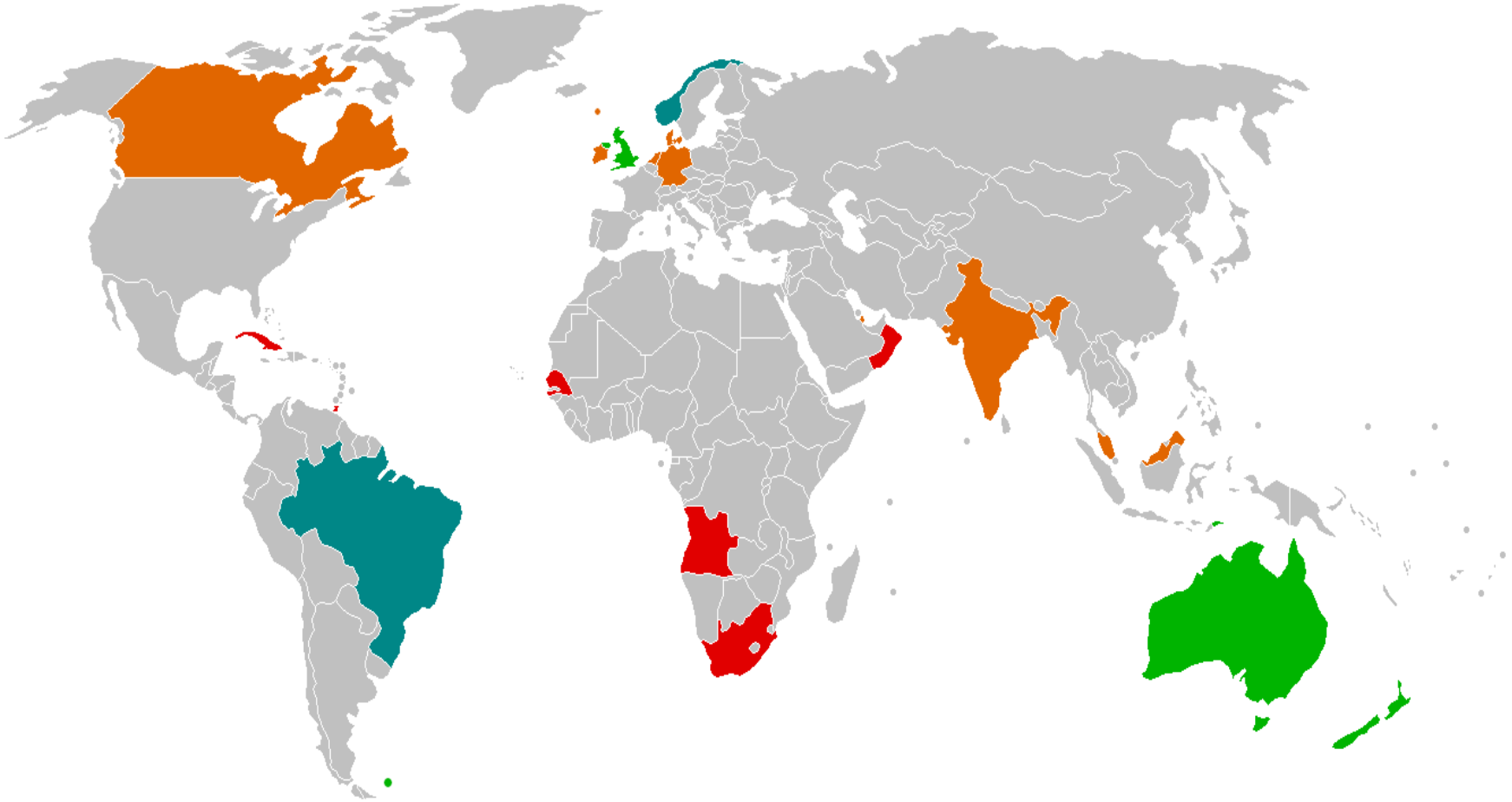
In 2014:

Level 1 – Full Objective based Safety Case

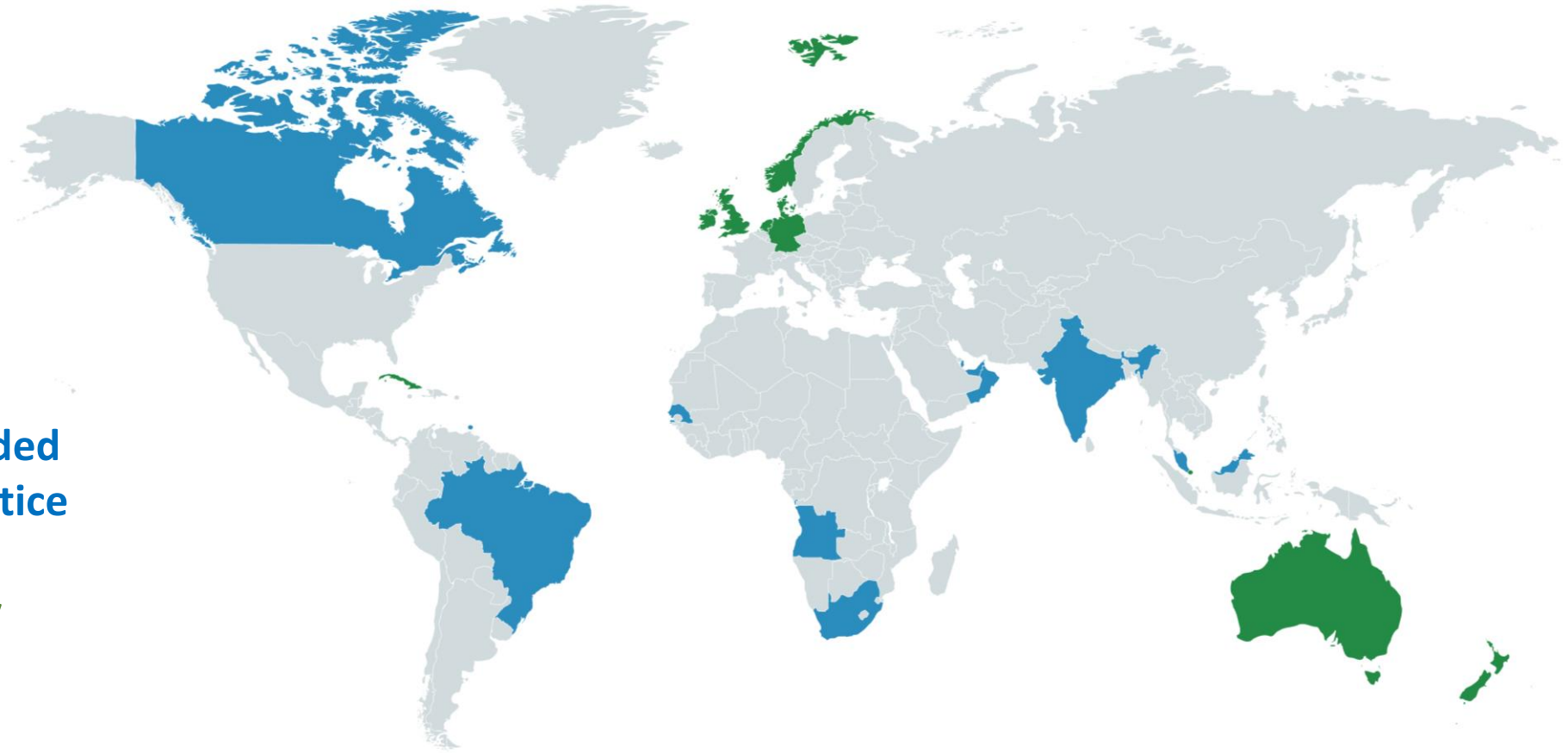
Level 2 – Part Objective, Part Prescription well established and managed

Level 3 – Recently established objective regime

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



Safety Case - Best Practice vs. Regulation



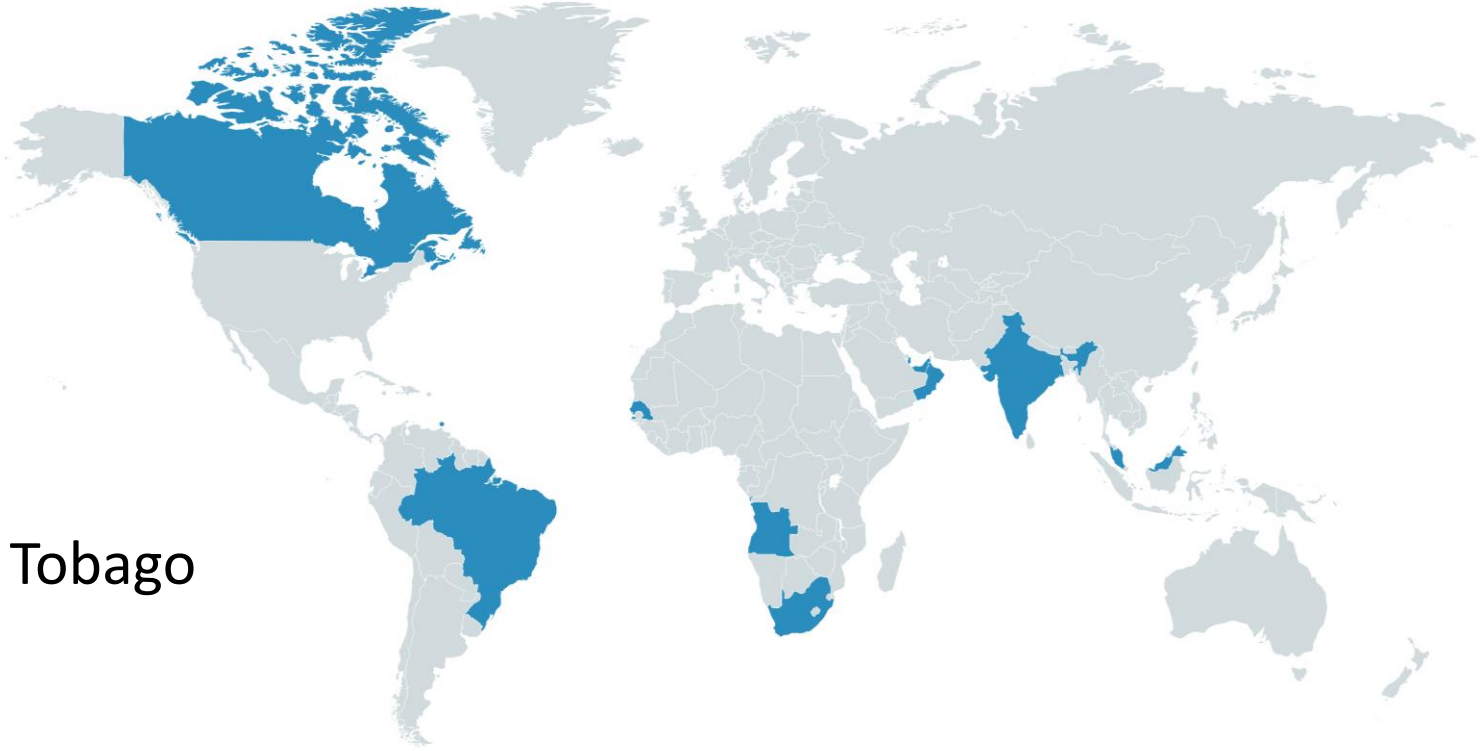
- **Recommended as Best Practice**
- **Required by Regulation**

Major Hazard Facility Regulation Around the World - Zoran Sekulic (Vanguard Risk and Safety Asia)

Safety Case (Best Practice)

Countries recommending the offshore Safety Case as best practice:

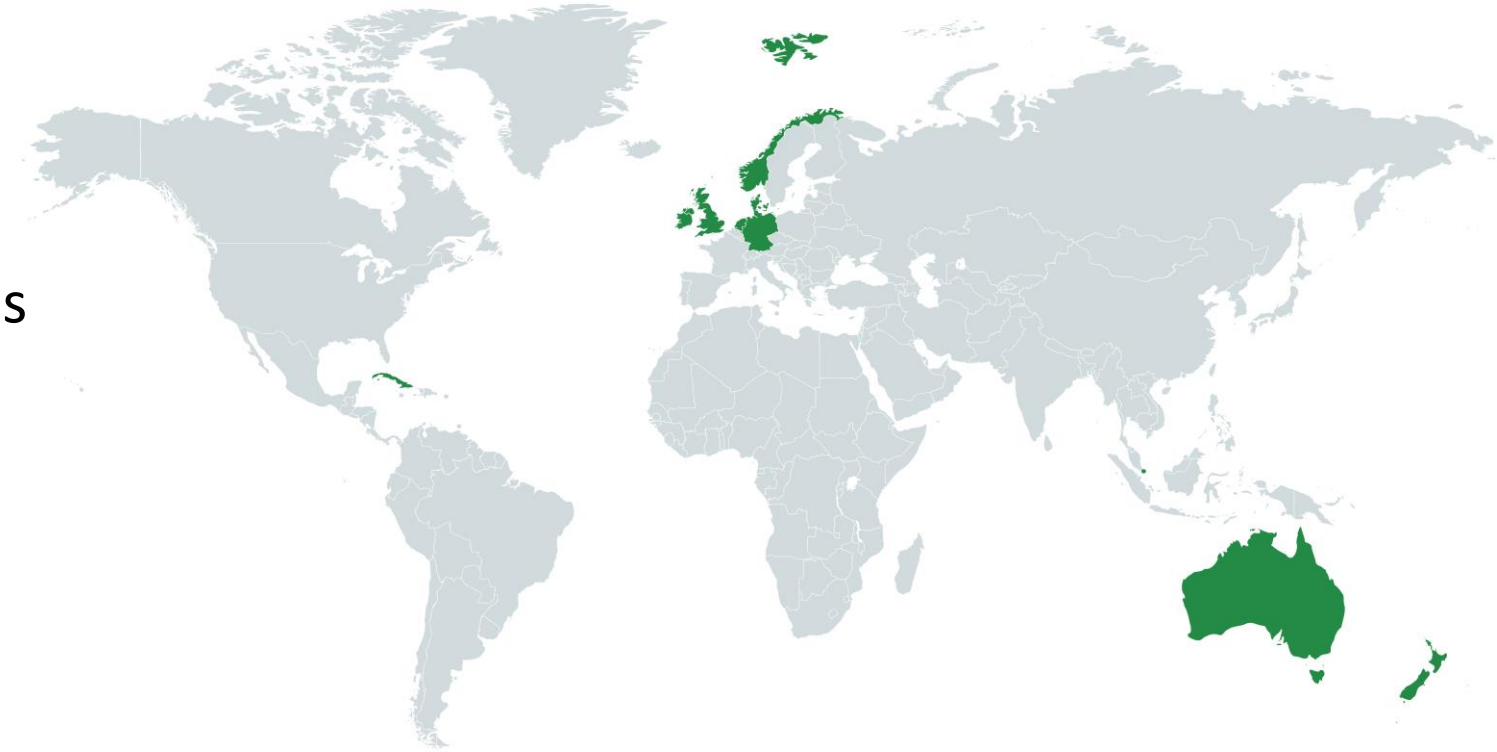
- South Africa
- India
- Malaysia
- Canada
- Brazil
- Angola
- Senegal
- Oman
- Qatar
- Trinidad and Tobago
- UAE



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



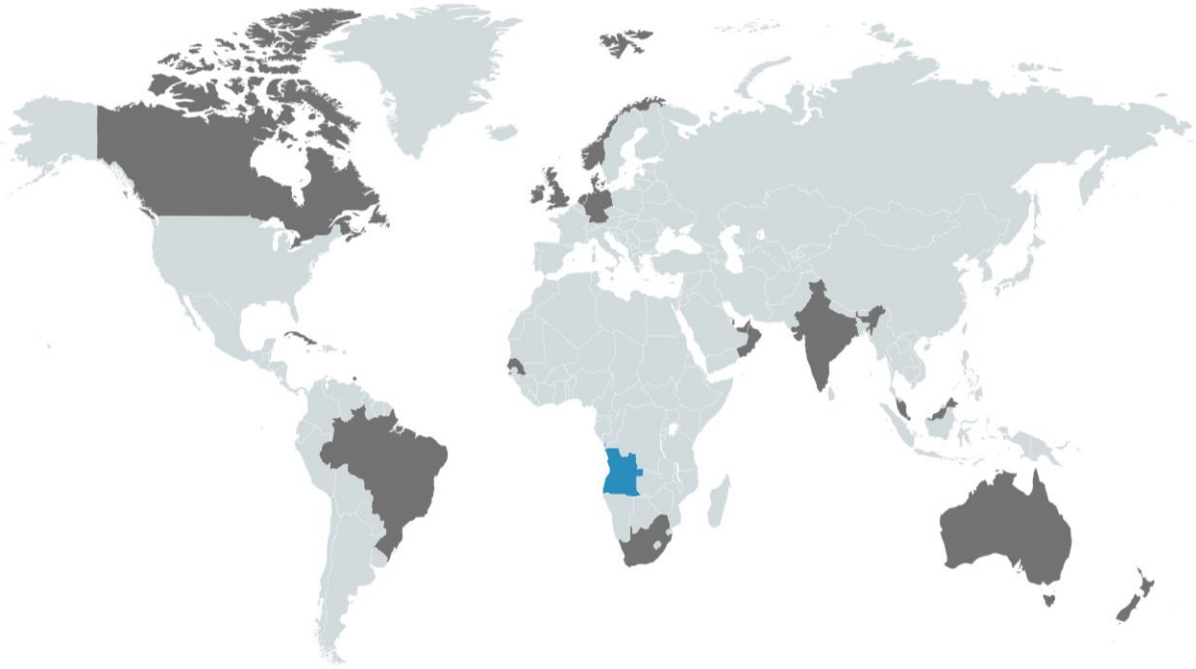
Global Regulation Review - Angola

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

- Minimum management system requirements stipulated

Other obligations include:

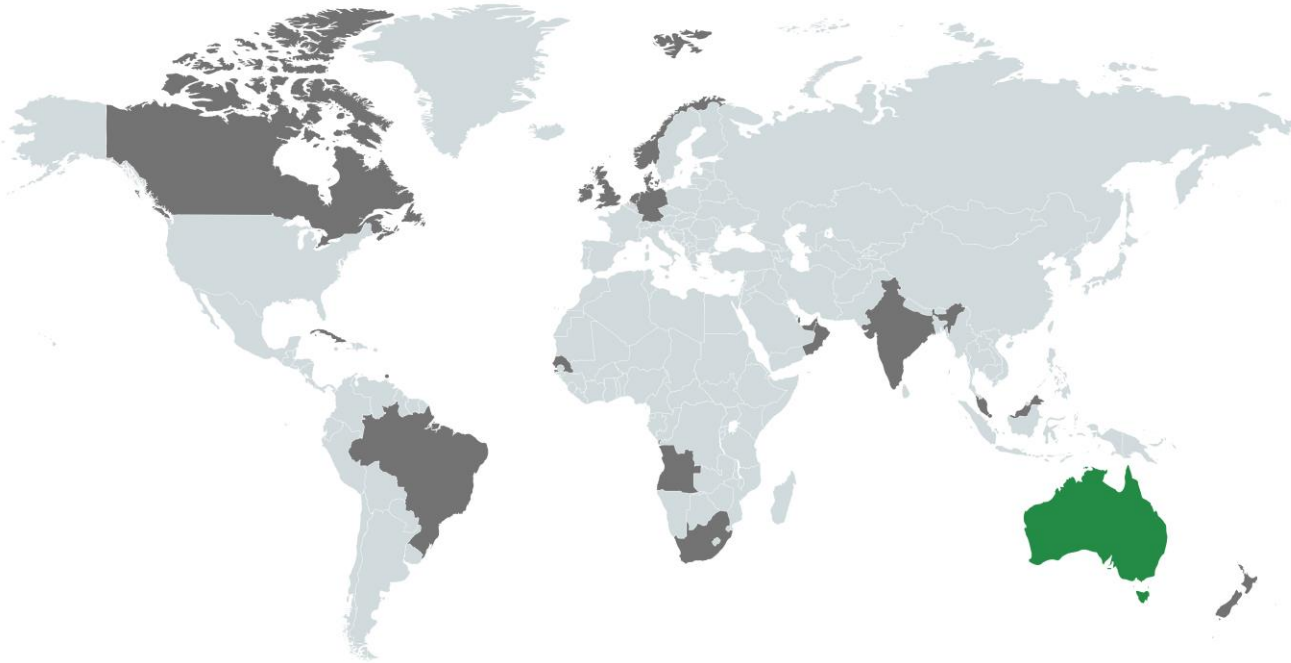
- Qualifications and training
- Risk analysis
- Emergency plans
- Health and safety plans and procedures
- Filing and reporting



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



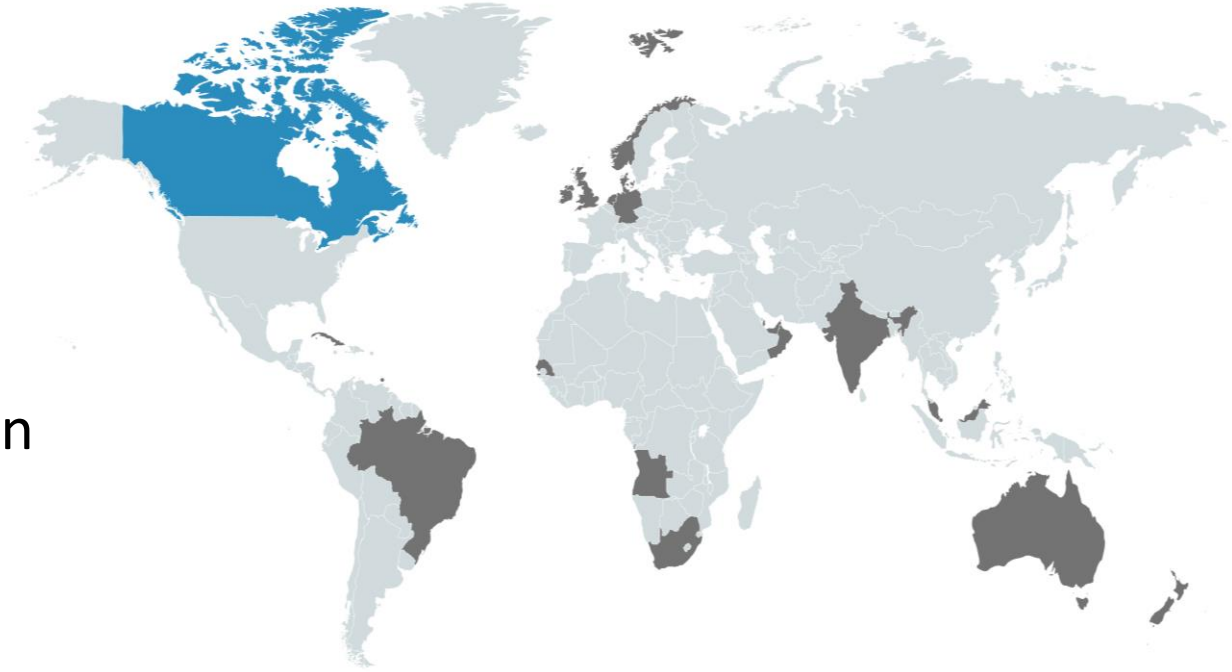
Global Regulation Review - Canada

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

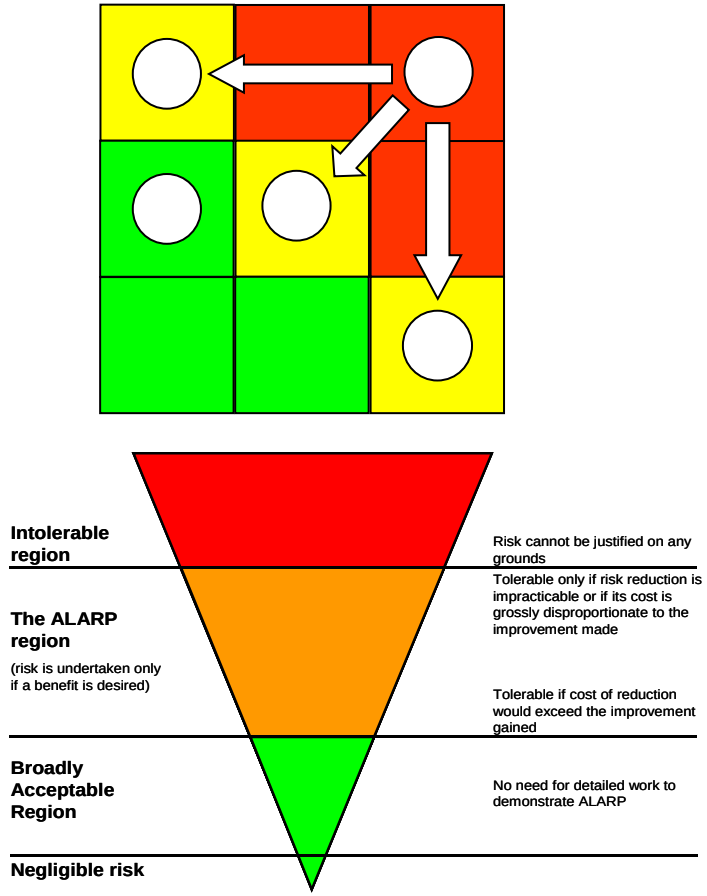
- MHI Regulations introduced under WSH Act to implement the Safety Case Regime in September 2017
- Safety Case reports to consolidate all SHE protocols and demonstrate that SHE Risks are managed to ALARP
- *Must identify all MAHs before performing a sufficient and suitable risk assessment and identify 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***



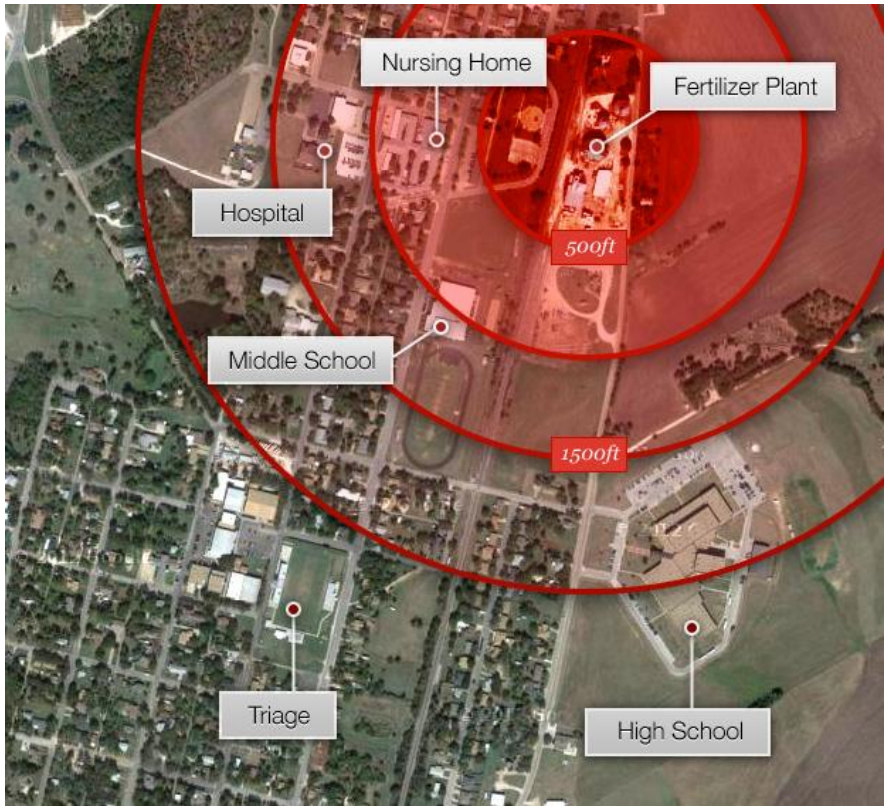
Will we have another Bhopal or Deepwater Horizon?

- *"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…



Major Hazard Facility Regulation Around the World

The authors wish to thank the Symposium organisers for the opportunity to make this presentation.

The authors wish to thank the following for their contributions:

Alex Chin, Vanguard Risk & Safety Asia Pte Ltd

Kimberley Phoon, Vanguard Solutions Pty Ltd

Safety Case Symposium 2019
Singapore
Mar 26 - 27, 2019
www.SafetyCaseSymposium.com

ANY QUESTIONS?

Vanguard
Risk & Safety Asia

Safety Case Symposium 2019

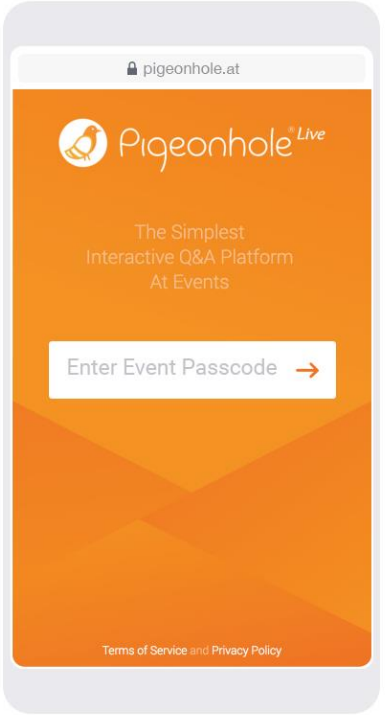
Singapore

Mar 26 - 27, 2019

Safety Case Symposium 2019
Singapore
Mar 26 - 27, 2019

Scan to submit your feedback for today's session

Safety Case Symposium 2019
Singapore
Mar 26 - 27, 2019



Go to:

www.pigeonhole.at

Enter Passcode:

SCS2019